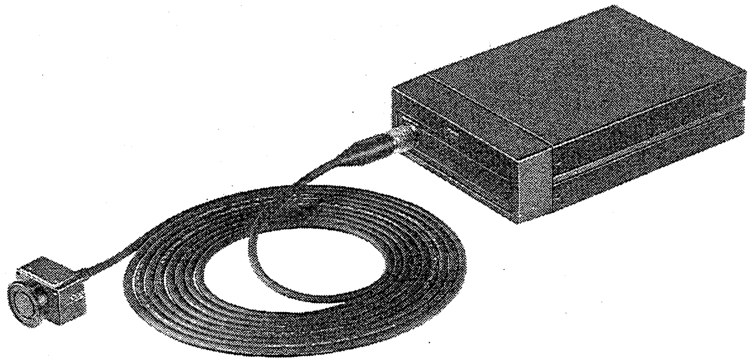
SONY®

CCD Video Camera Module

XC-77RR/77RR-CE



Camera Adaptor

DC-77RR/77RR-CE

Standard Lens

VCL-16Y-M

Extension Cable

CCXC-20P20

12-pin Connector

PC-XC12

Tripod Attachment

VCT-77RR

SERVICE MANUAL

XCM-77RR

For customers in the U.S.A.

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

For the customers in Canada

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

Pour les utilisateurs au Canada

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

For customers in the U.K.

WARNING
THIS APPARATUS MUST BE EARTHED

IMPORTANT
The wires in this mains lead are coloured in accordance with the following code:

Green-and-yellow:	Earth
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug proceed as follows:
The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured green or green-and-yellow.
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured red.

このマニュアルに記載されている事柄の著作権は当社にあり，説明内容は機器購入者の使用を目的としています。
従って，当社の許可なしに無断で複写したり，説明内容（操作，保守等）と異なる目的で本マニュアルを使用することを禁止します。

The material contained in this manual consists of information that is the property of Sony Corporation and is intended solely for use by the purchasers of the equipment described in this manual.
Sony Corporation expressly prohibits the duplication of any portion of this manual or the use thereof for any purpose other than the operation or maintenance of the equipment described in this manual without the express written permission of Sony Corporation.

Le matériel contenu dans ce manuel consiste en informations qui sont la propriété de Sony Corporation et sont destinées exclusivement à l'usage des acquéreurs de l'équipement décrit dans ce manuel.
Sony Corporation interdit formellement la copie de quelque partie que ce soit de ce manuel ou son emploi pour tout autre but que des opérations ou entretiens de l'équipement à moins d'une permission écrite de Sony Corporation.

Das in dieser Anleitung enthaltene Material besteht aus Informationen, die Eigentum der Sony Corporation sind, und ausschließlich zum Gebrauch durch den Käufer der in dieser Anleitung beschriebenen Ausrüstung bestimmt sind.
Die Sony Corporation untersagt ausdrücklich die Vervielfältigung jeglicher Teile dieser Anleitung oder den Gebrauch derselben für irgendeinen anderen Zweck als die Bedienung oder Wartung der in dieser Anleitung beschriebenen Ausrüstung ohne ausdrückliche schriftliche Erlaubnis der Sony Corporation.

SAFETY RELATED COMPONENT WARNING

Components identified by shading and ⚠ marked on the schematic diagrams and parts list are critical to safe operation. Replace these components with SONY parts whose part numbers appear as shown in this manual or in supplements published by SONY.

TABLE OF CONTENTS

1. OPERATION

1-1. Features .... 1-1(E)
1-2. Precautions .... 1-3(E)
1-3. Composition .... 1-4(E)
1-4. Location and Function of Parts .... 1-6(E)
  1-4-1. CCD video camera module
    XC-77RR/77RR-CE .... 1-6(E)
    Camera head unit .... 1-6(E)
    Camera control unit - front panel .... 1-7(E)
    Camera control unit - rear panel .... 1-13(E)
  1-4-2. Camera adaptor DC-77RR/77RR-CE .... 1-14(E)
    Front and inside .... 1-14(E)
    Rear panel .... 1-16(E)
  1-4-3. VCT-77RR tripod attachment .... 1-18(E)
1-5. Internal Switch Settings of the Camera Control Unit .... 1-19(E)
    PR-133 board .... 1-20(E)
    TG-58 board .... 1-20(E)
    DR-96 board .... 1-21(E)
1-6. Connections .... 1-23(E)
  1-6-1. Before connection .... 1-23(E)
  1-6-2. Installing XC-77RR/77RR-CE joined with DC-77RR/77RR-CE .... 1-23(E)
    How to join the XC-77RR/77RR-CE and the DC-77RR/77RR-CE .... 1-24(E)
    Changing the direction of the cable of the camera head unit .... 1-25(E)
    Fixing the camera head connector of the camera control unit .... 1-26(E)
  1-6-3. Synchronizing the camera with external S/VS/VBS signal .... 1-27(E)
  1-6-4. Synchronizing the camera with external HD and VD signals .... 1-28(E)
  1-6-5. Synchronizing other equipment with the internal sync signal of XC-77RR/77RR-CE .... 1-29(E)
  1-6-6. About the Supplied Screws .... 1-30(E)
  1-6-7. About the Length of the Screws Used to Mount the Camera Control Unit .... 1-30(E)
1-7. Special Characteristics of a CCD .... 1-31(E)

2. COMPREHENSIVE SPECIFICATIONS (XC-77RR)

2-1. SPECIFICATIONS 2-1
2-2. OUTPUT SIGNAL TIMING CHART 2-9
2-3. EXTERNAL SYNCHRONIZATION 2-10
  2-3-1. S/VS/VBS Mode 2-10
  2-3-2. HD and VD Mode 2-10
  2-3-3. RESTART RESET Mode 2-17
2-4. MODE SETTING 2-18
  2-4-1. Setting the Mode On the Front Panel 2-18
  2-4-2. Setting Modes In the Camera Control Unit 2-20
2-5. ELECTRONIC SHUTTER 2-22
  2-5-1. Normal Shutter Mode 2-22
  2-5-2. DONPISHA Shutter Mode 2-33
  2-5-3. Long Term Reset Shutter 2-33

3. THEORY OF OPERATION (XC-77RR)

3-1. OPERATION PRINCIPLE OF THE CCD 3-1
3-2. MECHANISM OF CCD CHARGE TRANSFER 3-1
3-3. PA-93 BOARD 3-2
3-4. PR-133 BOARD 3-3
3-5. TG-58 BOARD 3-4
3-6. DR-96 BOARD 3-4
3-7. SW-367 BOARD 3-4

4. ALIGNMENT (XC-77RR)

4-1. FIXTURES AND EQUIPMENT 4-1
4-2. ADJUSTMENT OF DR-96 BOARD 4-2
  4-2-1. Preparation 4-2
  4-2-2. +9.5V Voltage Adjustment 4-3
  4-2-3. CCD Substratum Voltage Adjustment 4-3
4-3. ADJUSTMENT OF PR-133 BOARD 4-4
  4-3-1. Preparation 4-4
  4-3-2. Connections 4-4
  4-3-3. SHP and SHD Adjustments 4-6
  4-3-4. Set-up Adjustment 4-8
  4-3-5. SYNC Adjustment 4-9
  4-3-6. Fixed Gain Sensitivity Adjustment 4-10
  4-3-7. AGC Adjustment 4-11
  4-3-8. White Clipping Adjustment 4-14

2. COMPREHENSIVE SPECIFICATIONS (XC-77RR-CE)

2-1. SPECIFICATIONS 2-1
2-2. OUTPUT SIGNAL TIMING CHART 2-9
2-3. EXTERNAL SYNCHRONIZATION 2-10
  2-3-1. S/VS/VBS Mode 2-10
  2-3-2. HD and VD Mode 2-10
  2-3-3. RESTART RESET Mode 2-17
2-4. MODE SETTING 2-18
  2-4-1. Setting the Mode On the Front Panel 2-18
  2-4-2. Setting Modes In the Camera Control Unit 2-20
2-5. ELECTRONIC SHUTTER 2-22
  2-5-1. Normal Shutter Mode 2-22
  2-5-2. DONPISHA Shutter Mode 2-33
  2-5-3. Long Term Reset Shutter 2-33

3. THEORY OF OPERATION (XC-77RR-CE)

3-1. OPERATION PRINCIPLE OF THE CCD 3-1
3-2. MECHANISM OF CCD CHARGE TRANSFER 3-1
3-3. PA-93 BOARD 3-2
3-4. PR-133 BOARD 3-3
3-5. TG-58 BOARD 3-4
3-6. DR-96 BOARD 3-4
3-7. SW-367 BOARD 3-4

4. ALIGNMENT (XC-77RR-CE)

4-1. FIXTURES AND EQUIPMENT 4-1
4-2. ADJUSTMENT OF DR-96 BOARD 4-2
  4-2-1. Preparation 4-2
  4-2-2. +9.5V Voltage Adjustment 4-3
  4-2-3. CCD Substratum Voltage Adjustment 4-3
4-3. ADJUSTMENT OF PR-133 BOARD 4-4
  4-3-1. Preparation 4-4
  4-3-2. Connections 4-4
  4-3-1. SHP and SHD Adjustments 4-6
  4-3-2. Set-up Adjustment 4-8
  4-3-3. SYNC Adjustment 4-9
  4-3-4. Fixed Gain Sensitivity Adjustment 4-10
  4-3-5. AGC Adjustment 4-11
  4-3-6. White Clipping Adjustment 4-14

A. DIAGRAM

A-1. OVERALL BLOCK DIAGRAM A-1
A-2. FRAM DIAGRAM A-5
A-3. PA-93 BOARD A-11
A-4. PR-133 BOARD A-17
A-5. DR-96 BOARD A-29

B. SEMICONDUCTOR

C. REPAIR PARTS

C-1. PARTS INFORMATION C-1
C-2. ELECTRICAL PARTS LIST C-2
    DR-96 Board C-2
    FL-108 Board C-3
    HN-134 Board C-3
    PA-93 Board C-4
    PR-133 Board C-5
    SW-367 Board C-7
C-3. EXPLODED VIEW C-8
    Camera Head Unit C-8
    Camera Control Unit C-9
C-4. ACCESSORIES AND PACKING MATERIALS .. C-11

D. CONVERSION TABLE FOR DECIMAL INTEGERS AND HEXADECIMAL INTEGERS

SECTION 1
OPERATION

1-1. Features

The XC-77RR/77RR-CE system is a camera system composed of the XC-77RR/77RR-CE CCD monochrome video camera module and DC-77RR/77RR-CE camera adaptor.

High quality image

The XC-77RR/77RR-CE has a large number of picture elements: 768x493 for the XC-77RR and 756 x 581 for the XC-77RR-CE. They enable the camera to produce a high quality image.
The picture elements of the XC-77RR-CE are arranged at the same intervals in vertical and horizontal directions, which allows easy addressing. This makes the XC-77RR-CE suitable for image processing systems that require highly accurate addressing.

Separation of the camera head from the camera control unit

For application to a microscope or in the semiconductor industry, the XC-77RR/77RR-CE is composed of a camera head unit and a camera control unit. Each unit's body is small and light.
You can use the camera head unit and the camera control unit up to 25 m apart by using an optional extension cable CCXC-20P20.

Combination of the camera control unit and the camera adaptor

You can also join the camera control unit of the XC-77RR/77RR-CE CCD camera to the DC-77RR/77RR-CE camera adaptor.

Electronic shutter

The XC-77RR/77RR-CE has an electronic shutter which enables the camera to produce clear images in still or slow-motion playback even when the subject is moving at a very high speed.
The XC-77RR/77RR-CE has two electronic shutter modes.

- Normal shutter mode: Ordinary electronic shutter mode
- DONPISHA shutter mode: The camera starts charging the CCD with the image information at the timing of the trigger signal (reset pulse). You can set the charging time by using the selectors on the camera. In this mode, the camera allows you to get a static image of the moving subject at any timing.

Adaptability to diversified signal processing

The XC-77RR/77RR-CE provides the following functions (selected by the switches on the camera control unit).

- Gain: Auto Gain Control (AGC)/Fixed gain (0 dB)
- Gamma: Compensation/Gamma=1
- White clip: Clip level=110 IRE/140 IRE (XC-77RR)
  Clip level=110%/140% (XC-77RR-CE)
- Integration mode: Frame integration mode/Field integration mode
- Scan mode: Interlace/Non-interlace
- Shutter mode: Normal/DONPISHA
  XC-77RR
  - Normal shutter mode: 1/63 to 1/3,580,000 seconds, selectable
  - DONPISHA shutter mode: 1/3.6 to 1/2,200 seconds, selectable

  XC-77RR-CE
  - Normal shutter mode: 1/52 to 1/2,360,000 seconds, selectable
  - DONPISHA shutter mode: 1/3.6 to 1/1,360 seconds, selectable

Three types of external sync signals

The camera system can operate in synchronization with other equipment using the three types of signals from an external sync signal generator.

- HD and VD signals: The camera system synchronizes depending on the interlace mode (interlace or non-interlace) selected by the input HD and VD signals.
- S/VS/VBS signal: The camera system synchronizes with the S (composite sync) signal or VS (video/composite sync) signal, or VBS (video/burst/composite sync) signal. According to the input signal, the camera system selects the sync system automatically.
- Reset pulse: Used to set the timing for the readout of resister contents at an arbitrary moment.

Internal sync signal output	The camera outputs the internal sync signal (the clock signal or HD/VD signals) activated by the internal switches of the camera.
Solid body	The body consists of aluminum diecast and steel sheet. The XC-77RR/77RR-CE has two screw holes (reference holes) for keeping deviation of the optical axis to a minimum.
Compatibility with XC-77/77CE series	The XC-77RR/77RR-CE has the same type of VIDEO OUT connectors and 12-pin multi-connector pin assignment as the XC-77/77CE series, as well as having identical cross section external dimensions. So the XC-77RR/77RR-CE can replace the XC-77/77CE series camera module.

1-2. Precautions

Safety

- Operate the camera system only with a power source specified in the "2-1. SPECIFICATIONS".
- Should any solid object or liquid fall into the cabinet, unplug the camera system and have it checked by qualified personnel before operating it any further.
- Unplug the camera system from the wall outlet if it is not to be used for an extended period of time. To unplug the unit, pull by the plug. Never pull the cord itself.

Installation

- Allow adequate air circulation to prevent internal heat buildup.
- Do not install the camera system near a heat source such as a radiator or an air duct, or in a place subject to direct sunlight, excessive dust, mechanical vibration or shock.
- Keep the camera system away from equipment with strong magnets.
- Avoid operating or storing the camera system near a TV or radio station that radiates high-powered radio frequencies.

Operation

When the camera system is not in use, turn the power off.

Cleaning

Clean the cabinets and panels with a dry soft cloth, or a soft cloth lightly moistened with mild detergent solution.

Transportation

Save the original cartons and associated packing materials. They will be useful when you transport or ship the camera system.

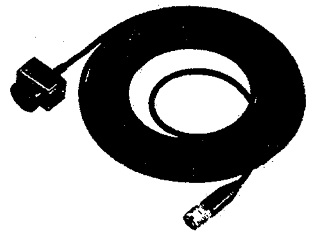
If you have any questions about the camera system, contact your dealer.

1-3. Composition

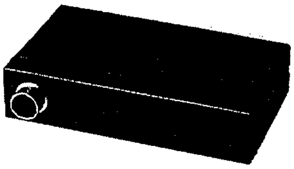
The XC-77RR/77RR-CE CCD video camera module system consists of the following optional products.

CCD video camera module XC-77RR/77RR-CE

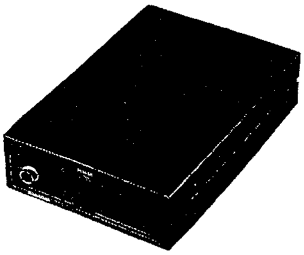
Camera head unit



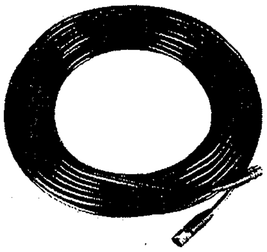
Camera control unit



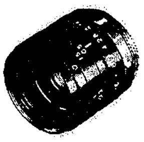
Camera adaptor DC-77RR/77RR-CE



Extension cable CCXC-20P20 (20 m)
Used to extend the distance between the camera head unit and the camera control unit of the XC-77RR/77RR-CE.

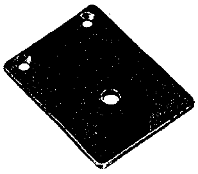


Standard lens VCL-16Y-M



12-pin connector PC-XC12
Used when making your own cable which connects the DC IN/SYNC/VIDEO connector on the XC-77RR/77RR-CE and a piece of equipment other than DC-77RR/77RR-CE.

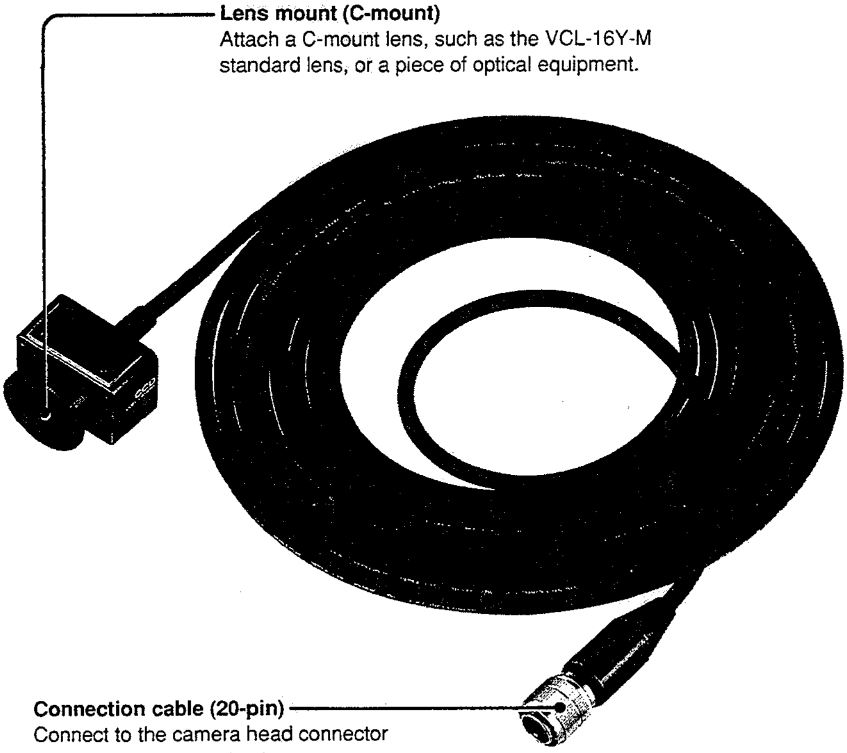
Tripod attachment VCT-77RR
Used to attach the camera head unit to the tripod.



1-4. Location and Function of Parts

1-4-1. CCD Video Camera Module XC-77RR/77RR-CE

Camera head unit

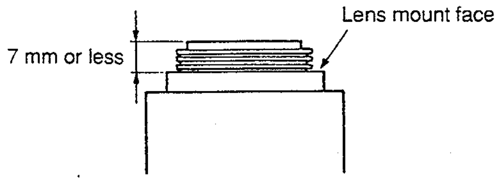


Lens mount (C-mount)
Attach a C-mount lens, such as the VCL-16Y-M standard lens, or a piece of optical equipment.

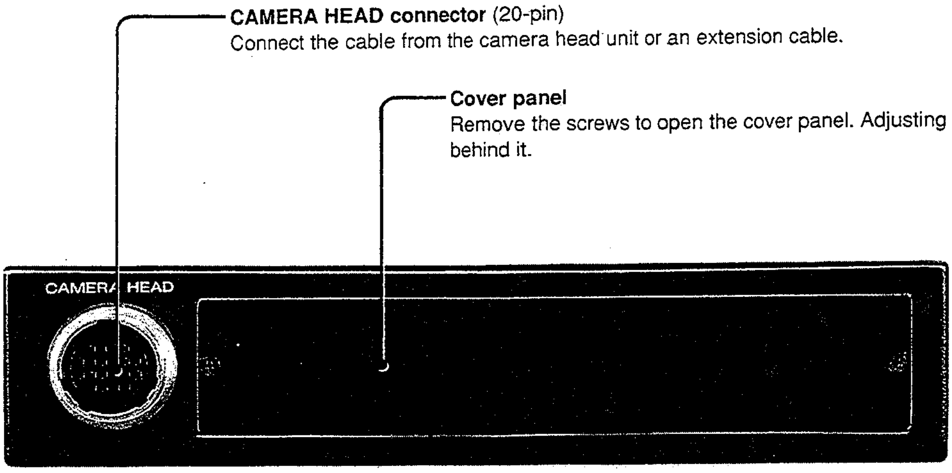
Connection cable (20-pin)
Connect to the camera head connector on the camera control unit.

Note

The lens or other piece of optical equipment must not project more than 7 mm from the lens mount face.



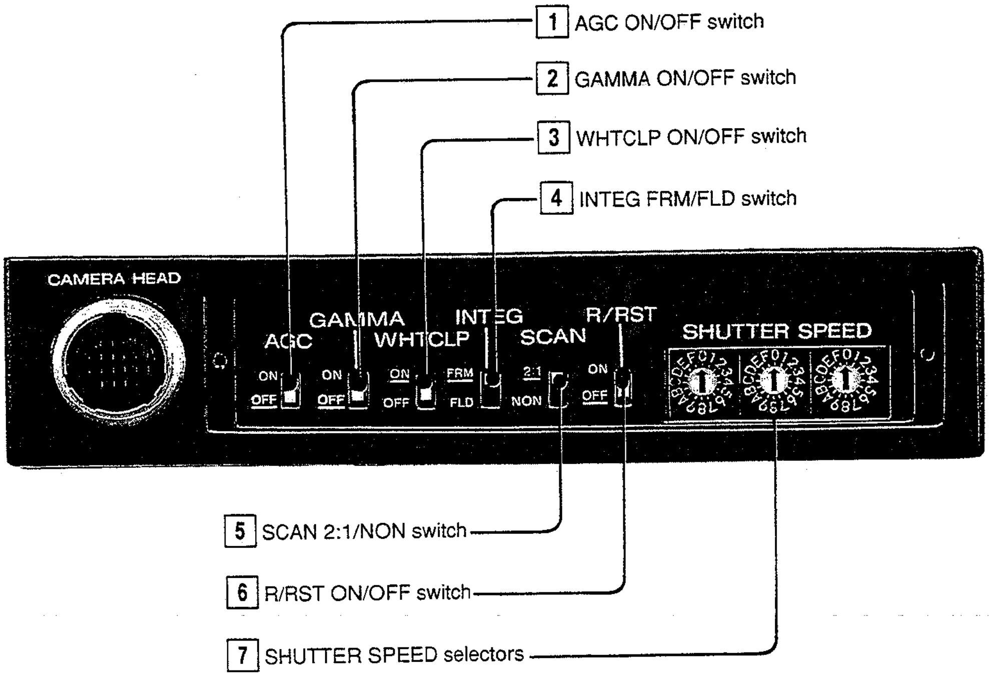
Camera control unit – front panel


CAMERA HEAD

CAMERA HEAD connector (20-pin)
Connect the cable from the camera head unit or an extension cable.

Cover panel
Remove the screws to open the cover panel. Adjusting switches are behind it.

Inside the cover panel


CAMERA HEAD
AGC
GAMMA
WHTCLP
INTEG
SCAN
R/RST
SHUTTER SPEED
ON
OFF
ON
OFF
ON
OFF
FRM
FLD
2:1
NON
ON
OFF

1 AGC ON/OFF switch

2 GAMMA ON/OFF switch

3 WHTCLP ON/OFF switch

4 INTEG FRM/FLD switch

5 SCAN 2:1/NON switch

6 R/RST ON/OFF switch

7 SHUTTER SPEED selectors

① **AGC (auto gain control) ON/OFF switch**
ON: Auto gain control
OFF: Fixed gain=0 dB (factory setting)

② **GAMMA (gamma compensation) ON/OFF switch**
ON: Gamma compensation
OFF: Gamma=1 (factory setting)

③ **WHTCLP (white clip) ON/OFF switch**
ON: Clip level=110 IRE (XC-77RR) / 110% (XC-77RR-CE) (factory setting)
OFF: Clip level=140 IRE (XC-77RR) / 140% (XC-77RR-CE)

④ **INTEG FRM/FLD (integrate frame/field) switch**
FRM: Frame integration mode (factory setting)
FLD: Field integration mode

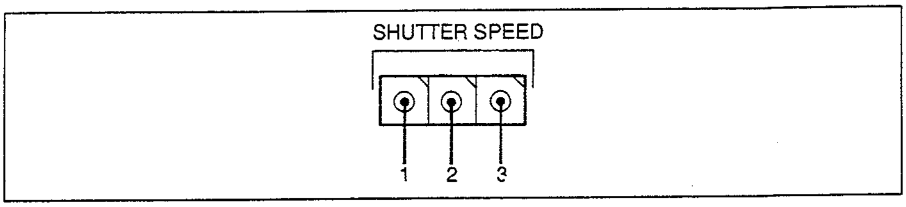
⑤ **SCAN 2:1/NON (2:1 interlace/non-interlace) switch**
2:1: 2:1 interlace (factory setting)
NON: Non-interlace
This switch is effective only when the camera is synchronized with the internal sync signal. When synchronizing the camera with other equipment using the external sync signal, set this switch to "2:1".

⑥ **R/RST (restart reset) ON/OFF switch**

- When the SHUTTER SPEED selectors ⑦ are set to "000", this switch sets the restart reset mode to ON or OFF.
- When the SHUTTER SPEED selectors ⑦ are set to other than "000", this switch selects the shutter mode.
  ON: DONPISHA shutter mode
  OFF: Normal shutter mode (factory setting)
  Set the shutter speed of each shutter mode using the SHUTTER SPEED selectors ⑦.

⑦ SHUTTER SPEED selectors

Select the shutter speed using the 1, 2 and 3 selectors. Each selector setting represents each digit of the hexadecimal number.
The setting of the shutter speed is different between the XC-77RR and XC-77RR-CE, and between the normal shutter mode and the DONPISHA shutter mode.



Factory setting

$$\left.\begin{array}{l}\text{1's setting: 0}\\ \text{2's setting: 0}\\ \text{3's setting: 0}\end{array}\right\}\quad \text{Electronic shutter: OFF}$$

XC-77RR

a) Normal shutter mode

- When the selectors settings are:

$$\begin{pmatrix}\text{1's setting: 0}\\ \text{2's setting: 0}\\ \text{3's setting: 1}\end{pmatrix} \text{ to } \begin{pmatrix}\text{1's setting: 0}\\ \text{2's setting: F}\\ \text{3's setting: 2}\end{pmatrix}$$

$$\text{Shutter speed (sec)} = \frac{113{,}597 - 455\,[(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{7{,}159{,}091}$$

- When the selectors settings are:

$$\begin{pmatrix}\text{1's setting: 0}\\ \text{2's setting: F}\\ \text{3's setting: 3}\end{pmatrix} \text{ to } \begin{pmatrix}\text{1's setting: 6}\\ \text{2's setting: D}\\ \text{3's setting: D}\end{pmatrix}$$

$$\text{Shutter speed (sec)} = \frac{3516 - 2\,[(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{7{,}159{,}091}$$

- Do not select any of the following settings. The normal video signal is not output if you select one of these settings.

$$\begin{pmatrix}\text{1's setting: 6}\\ \text{2's setting: D}\\ \text{3's setting: E}\end{pmatrix} \text{ to } \begin{pmatrix}\text{1's setting: F}\\ \text{2's setting: F}\\ \text{3's setting: F}\end{pmatrix}$$

b) DONPISHA shutter mode

$$\text{Shutter speed (sec)} = \frac{5609 + 910\,[(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{14{,}318{,}182}$$

Shutter speed setting examples (XC-77RR)

Shutter speed (sec)	Shutter mode	SHUTTER SPEED selectors		
		1's setting	2's setting	3's setting
1/100	Normal	0	5	C
	DONPISHA	0	9	7
1/120	Normal	0	7	7
	DONPISHA	0	7	D
1/250	Normal	0	B	B
	DONPISHA	0	3	9
1/500	Normal	0	D	A
	DONPISHA	0	1	9
1/1000	Normal	0	E	A
	DONPISHA	0	0	A
1/2000	Normal	0	F	2
	DONPISHA	0	0	2
1/4000	Normal	3	5	F
	DONPISHA	—	—	—
1/10,000	Normal	5	7	8
	DONPISHA	—	—	—

This table shows the settings of the field integration mode. In the frame integration mode, the charging time of the even-numbered fields is 5.04 µsec longer than that of the field integration mode. When you set the shutter speed too high, the difference of the charging time at each field causes flicker.
In the electronic shutter mode of XC-77RR, we recommend to set the INTEG FRM/FLD switch to FLD (field integration mode).

XC-77RR-CE

a) Normal shutter mode

- When the selectors settings are:

$$\begin{pmatrix} \text{1's setting: 0} \\ \text{2's setting: 0} \\ \text{3's setting: 1} \end{pmatrix} \text{ to } \begin{pmatrix} \text{1's setting: 1} \\ \text{2's setting: 1} \\ \text{3's setting: F} \end{pmatrix}$$

$$\text{Shutter speed (sec)} = \frac{601 - 2\,[(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{31{,}250}$$

- When the selectors settings are:

$$\begin{pmatrix} \text{1's setting: 1} \\ \text{2's setting: 2} \\ \text{3's setting: 0} \end{pmatrix} \text{ to } \begin{pmatrix} \text{1's setting: B} \\ \text{2's setting: 5} \\ \text{3's setting: 0} \end{pmatrix}$$

$$\text{Shutter speed (sec)} = \frac{1159}{1{,}418{,}750} - \frac{(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})}{3{,}546{,}875}$$

- Do not select any of the following settings. The normal video signal is not output if you select one of these settings.

$$\begin{pmatrix} \text{1's setting: B} \\ \text{2's setting: 5} \\ \text{3's setting: 1} \end{pmatrix} \text{ to } \begin{pmatrix} \text{1's setting: F} \\ \text{2's setting: F} \\ \text{3's setting: F} \end{pmatrix}$$

b) DONPISHA shutter mode

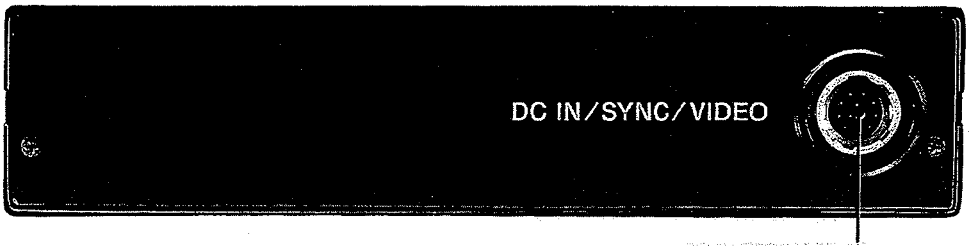
$$\text{Shutter speed (sec)} = \frac{10{,}149 + 908\,[(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{14{,}187{,}500}$$

Shutter speed setting examples (XC-77RR-CE)

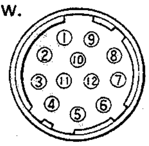
Shutter speed (sec)	Shutter mode	SHUTTER SPEED selectors		
		1's setting	2's setting	3's setting
1/100	Normal	0	9	0
	DONPISHA	0	9	1
1/120	Normal	0	A	A
	DONPISHA	0	7	7
1/250	Normal	0	E	E
	DONPISHA	0	3	3
1/500	Normal	1	0	D
	DONPISHA	0	1	4
1/1000	Normal	1	1	D
	DONPISHA	0	0	4
1/2000	Normal	4	6	4
	DONPISHA	—	—	—
1/4000	Normal	7	D	B
	DONPISHA	—	—	—
1/10,000	Normal	9	E	F
	DONPISHA	—	—	—

In the normal shutter mode, this table shows the settings of the field integration mode. In the frame integration mode, the charging time of the even-numbered field is 5.04 µsec longer than that of the field integration mode. When you set the shutter speed too high, the difference of the charging time at each field causes flicker.
In the normal shutter mode of XC-77RR-CE, we recommend to set the INTEG FRM/FLD switch to FLD (field integration mode).

Camera control unit — rear panel



DC IN/SYNC/VIDEO connector (12-pin)
Connects to the camera adaptor.
The pin configuration of this connector is shown in the diagram below.



Signal / Pin No.	Sync mode		
	External sync mode		Internal sync mode
	HD, VD	S/VS/VBS	
1	Ground	Ground	Ground
2	+12 V	+12 V	+12 V
3	Video output (ground)	Video output (ground)	Video output (ground)
4	Video output (signal)	Video output (singal)	Video output (signal)
5	HD input (ground)	—	Internal HD output (groud)
6	HD input (signal)	—	Internal HD output (signal)
7	VD input (signal)/ trigger* input	S/VS/VBS input (signal)	Internal VD output (signal)
8	Internal VD output (ground)	Internal VD output (ground)	Internal VD output (ground)
9	Internal VD output (signal)/Internal clock output**	Internal VD output (signal)/Internal clock output**	Internal VD output (signal)/Internal clock output**
10	Ground	Ground	Ground
11	+12 V	+12 V	+12 V
12	VD input (ground)	S/VS/VBS input (ground)	InternalVD output (ground)

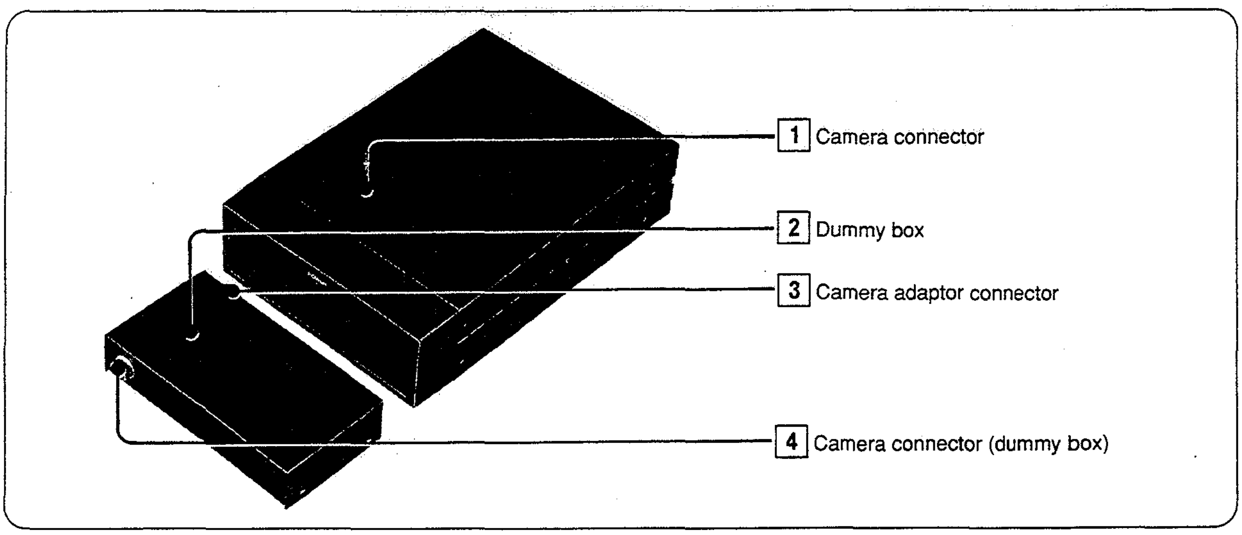
The camera is preset in the external synchronization mode at the factory. It automatically selects the reference signal (HD, VD or S/VS/VBS) according to the input signal.
When you use the HD output (pin No. 6) and VD output (pin No. 7) of the internal sync signal, you may set the switch on the internal board.

* Trigger: The pulse for the DONPISHA shutter mode.

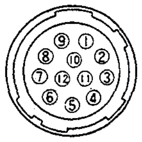
** You can change the output of pin 9 from internal VD signal to internal clock signal using an internal switch.

1-4-2. Camera Adaptor DC-77RR/77RR-CE

Front and inside


1 Camera connector
2 Dummy box
3 Camera adaptor connector
4 Camera connector (dummy box)

① **Camera connector** (12-pin)

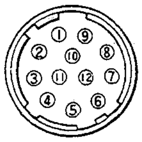

9
1
8
10
2
7
12
11
3
6
5
4

When you directly join the XC-77RR/77RR-CE with the DC-77RR/77RR-CE, connect this connector to the DC IN/SYNC/VIDEO connector of the XC-77RR/77RR-CE completely.

② **Dummy box**

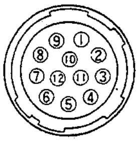
When you directly join the XC-77RR/77RR-CE with the DC-77RR/77RR-CE, replace this box with the XC-77RR/77RR-CE.

③ **Camera adaptor connector** (12-pin)


1
9
2
10
8
3
11
12
7
4
5
6

Connect this connector to the camera connector of the camera adaptor 1 if you use the dummy box.

④ **Camera connector (dummy box)** (12-pin)



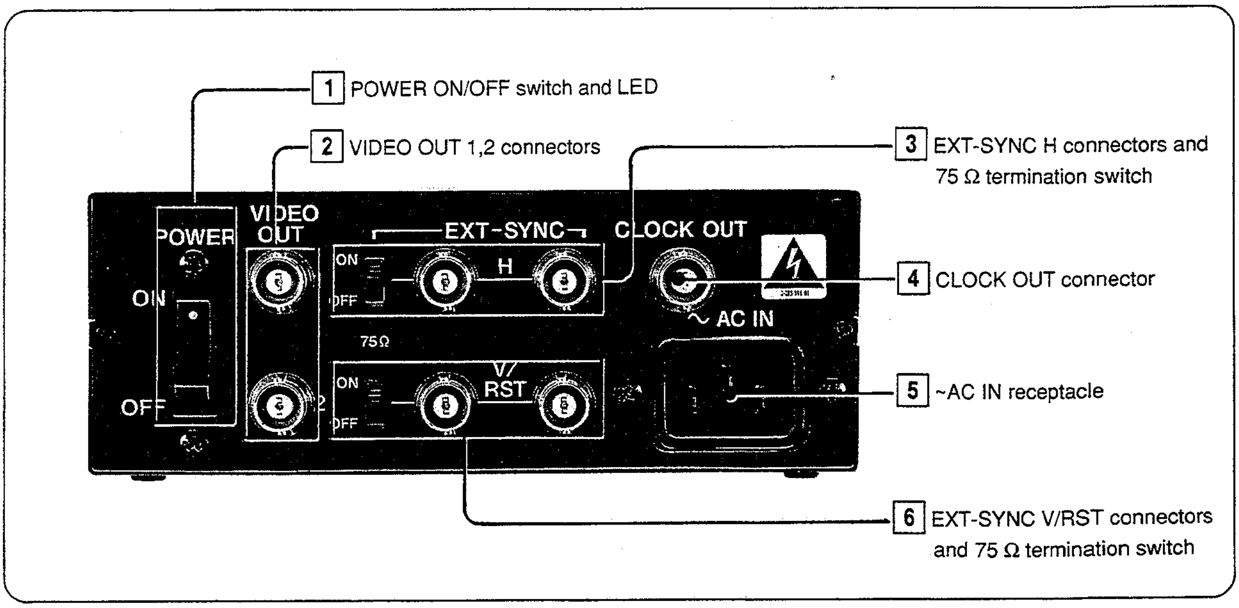
When you use the camera adaptor with a camera other than the XC-77RR/77RR-CE, insert the dummy box and connect this connector to the camera using an optional cable.

The pin assignment of the connectors [1], [3] and [4] is as follows.

Signal / **Pin No.**	**Sync mode of a camera**		
	External sync mode		**Internal sync mode Camera sync output**
	HD, VD	**S/VS/VBS**	
1	Ground	Ground	Ground
2	+12 V	+12 V	+12 V
3	Video input (ground)	Video input (ground)	Video input (ground)
4	Video input (signal)	Video input (singal)	Video input (signal)
5	HD output (ground)	—	Internal HD input (groud)
6	HD output (signal)	—	Internal HD input (signal)
7	VD output (signal)/ trigger output	S/VS/VBS output (signal)	Internal VD input (signal)
8	Internal VD input (ground)	Internal VD input (ground)	Internal VD input (ground)
9	Internal VD input (signal)/Internal clock input*	Internal VD input (signal)/Internal clock input*	Internal VD input (signal)/Internal clock input*
10	Ground	Ground	Ground
11	+12 V	+12 V	+12 V
12	VD output (ground)	S/VS/VBS output (ground)	Internal VD input (ground)

* The input signal of pin 9 goes out through the CLOCK OUT connector on the rear panel.

Rear panel


1 POWER ON/OFF switch and LED
2 VIDEO OUT 1,2 connectors
3 EXT-SYNC H connectors and 75 Ω termination switch
4 CLOCK OUT connector
5 ~AC IN receptacle
6 EXT-SYNC V/RST connectors and 75 Ω termination switch
POWER
ON
OFF
VIDEO OUT
2
EXT-SYNC
ON
OFF
H
75Ω
V/ RST
CLOCK OUT
~ AC IN

(1) **POWER ON/OFF switch and LED**

Press the ON side of this switch to supply power to the adaptor. The LED lights up.

(2) **VIDEO OUT 1,2 connectors** (BNC type)

Used to output the video signal picked up by the camera.

(3) **EXT-SYNC H (external sync HD signal input/output) connectors** (BNC type) **and 75 Ω termination switch**

Used to input/output the external HD signal or to output the internal HD signal of the XC-77RR/77RR-CE. You must select the internal or external signal on the connected camera.
To operate the connected camera in the external sync system using the HD/VD signals, input the HD signal through one of these connectors. You can use the other connector as a loop-through output. To use the loop-through output, set the 75 Ω termination switch to OFF. Otherwise, set the switch to ON.
To use the internal HD signal output of the XC-77RR/77RR-CE, set the 75 Ω termination switch to OFF.

(4) **CLOCK OUT (clock signal output) connector** (BNC type)

Used to output the internal clock signal or the internal VD signal of the connected camera. You must select the output signal on the connected camera.

(5) **~AC IN receptacle**

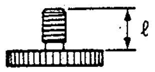
Connect to an AC outlet using the supplied AC power cord.

⑥ EXT-SYNC V/RST (external sync VD signal/ reset pulse input/output) connectors and 75 Ω termination switch

Used to input/output the external VD signal and reset pulse or to output the internal VD signal. You must select the internal or external signal on the connected camera.
To operate the connected camera in the external sync system, input the external sync VD signal and the reset pulse through one of these connectors. You can use the other connector as a loop-through output. To use the loop-through output, set the 75 Ω termination switch to OFF. Otherwise, set the switch to ON.
To use the internal VD signal output of the XC-77RR/77RR-CE, set the 75 Ω termination switch to OFF.

1-4-3. VCT-77RR Tripod Attachment

The screws must also meet the following specifications.
ISO standard: ℓ = 4.5 mm + 0.2 mm
ASA standard: ℓ = 0.197 inches

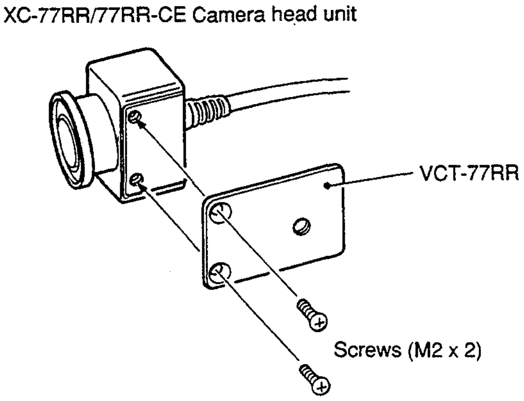


Caution

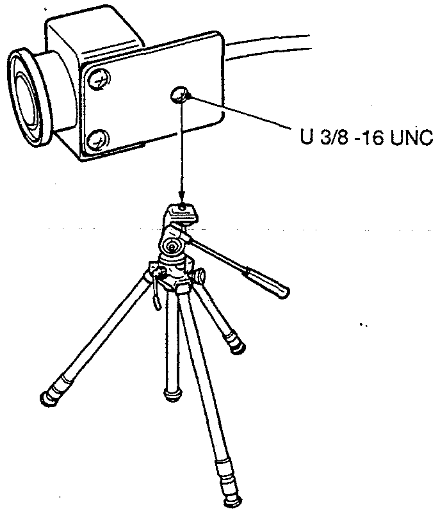
Use screws which are less than 4 mm (3/16 inches) long to attach the tripod attachment. If the screw being used is too long, the screw may damage the circuit boards inside the camera head unit.

How to attach the tripod to the camera head unit.

1


XC-77RR/77RR-CE Camera head unit
VCT-77RR
Screws (M2 x 2)

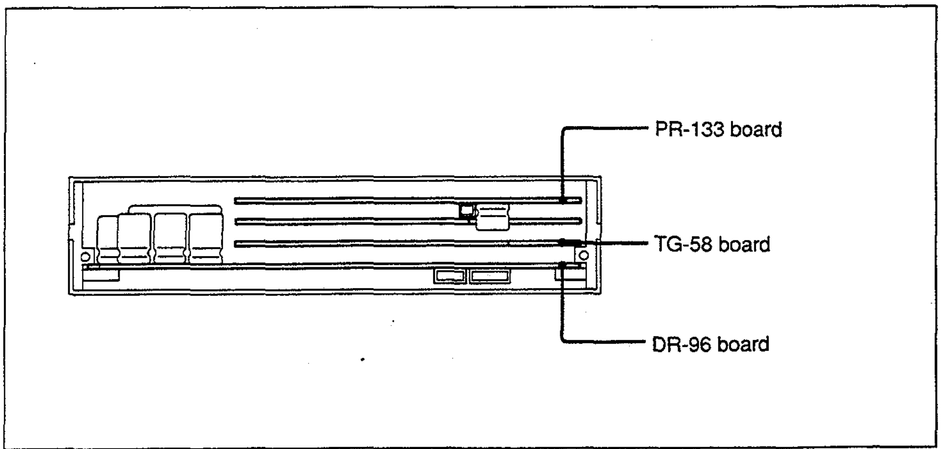
2



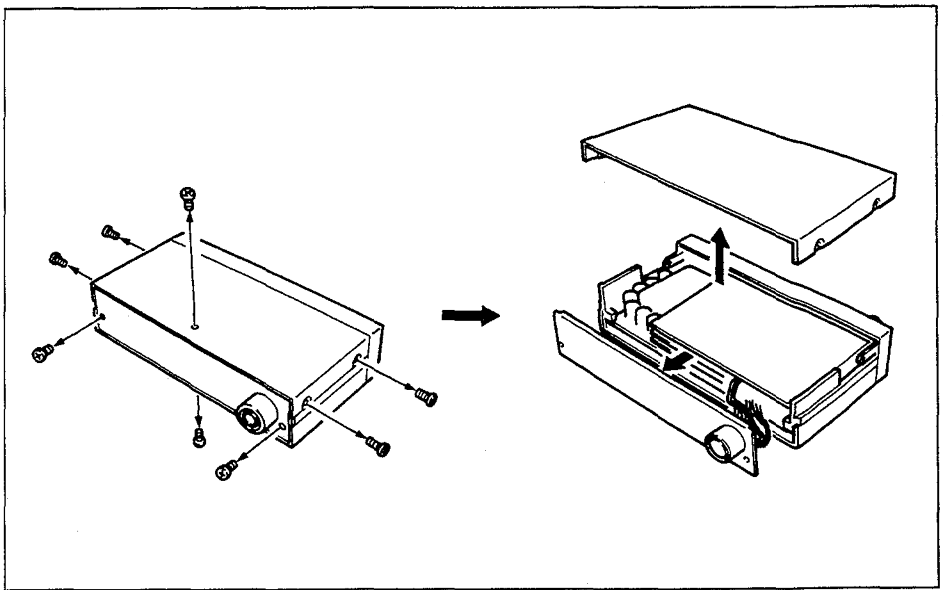
1-5. Internal Switch Settings of the Camera Control Unit

Notes

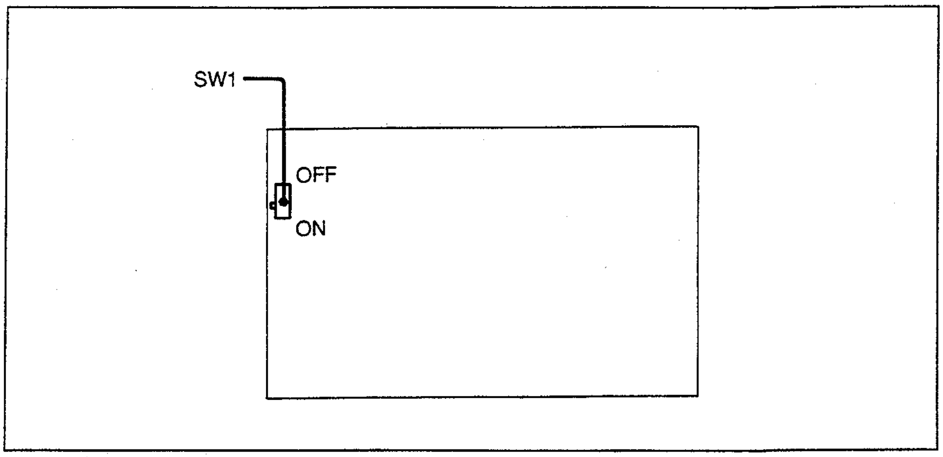
- For safety, turn the camera off when you set the switches on the internal board.
- Do not remove the DR-96 board from the bottom of the camera control unit. The DR-96 board is fixed to the bottom of the camera, and will not be detached even if the screws are removed.



How to open the panel

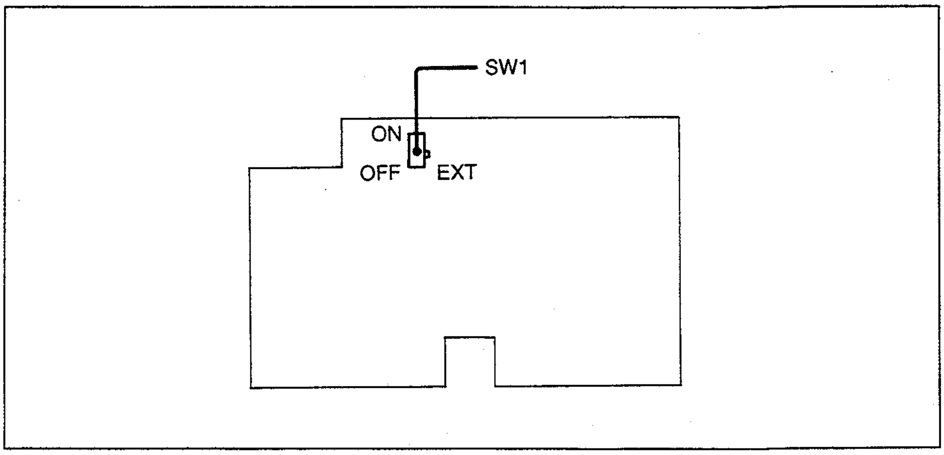


PR-133 board



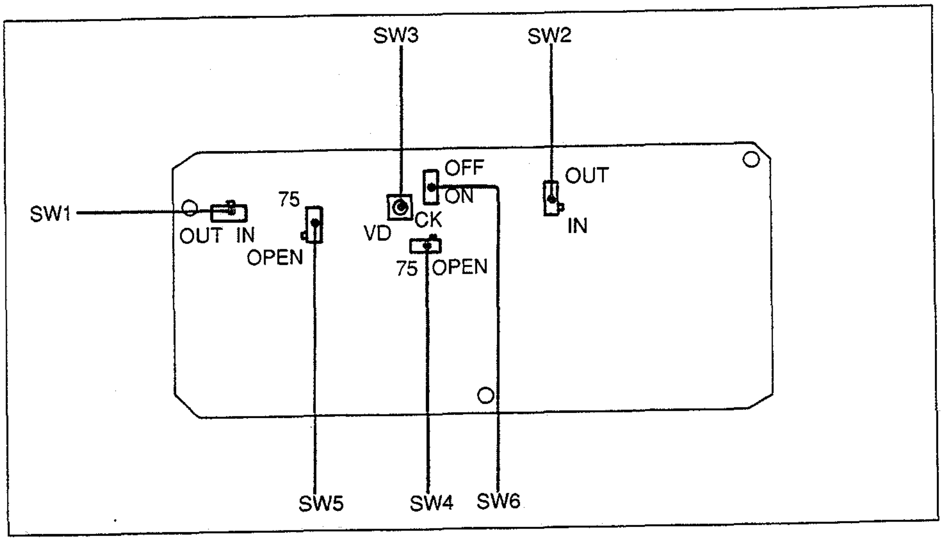
SW1 (SYNC ON/OFF switch)
Select whether or not to add the sync signal to the video signal output through the DC IN/SYNC/VIDEO connector.
ON: To add the composite sync signal (factory setting)
OFF: Not to add the composite sync signal.

TG-58 board



SW1 [EXT HD (THROUGH OUT)/INT HD (SUB SG OUT) switch]
When the unit is set to the restart reset, DONPISHA shutter or long-term reset mode, use this switch to select the external HD signal input or the this internal HD signal to function the mode chosen.
ON: External HD signal
OFF: Internal HD signal (factory setting)

DR-96 board



SW1 (EXT VD IN/INT VD OUT switch)
Used to select the signal input or output through the EXT-SYNC V/RST connectors of the connected DC-77RR/77RR-CE camera adaptor.
OUT: To input the external VD signal from the external equipment. (factory setting)
IN: To output the internal VD signal.

SW2 (EXT HD IN/INT HD OUT switch)
Used to select the signal input or output through the EXT-SYNC H connectors of the connected DC-77RR/77RR-CE camera adaptor.
OUT: To input the external HD signal from the external equipment. (factory setting)
IN: To output the internal HD signal of the camera.

SW3 (CLOCK OUT/INT VD OUT switch)
Used to select the signal output through the CLOCK OUT connector of the connected DC-77RR/77RR-CE camera adaptor.
CK: The internal clock signal (XC-77RR: 14.318182 MHz, XC-77RR-CE: 14.1875 MHz) of the camera.
The output signal level is more than 0.5Vp-p when the signal is terminated at the 75 Ω.
VD: The internal VD signal of the camera. (factory setting)

SW4 (EXT HD 75 Ω ON/OFF switch)
This is the 75 Ω termination switch of the HD signal. Use this switch when the camera inputs the external HD signal through the connected DC-77RR/77RR-CE camera adaptor.
75: Not to use the loop-through output of the external HD signal.
OPEN: To use the loop-through output of the external HD signal. (factory setting)

SW5 (EXT VD 75 Ω ON/OFF switch)
This is the 75 Ω termination switch of the VD signal. Use this switch when the camera inputs the external VD signal through the connected camera adaptor.
75: Not to use the loop-through output of the external VD signal.
OPEN: To use the loop-through output of the external VD signal. (factory setting)

SW6 [L.T.R. (long term reset) ON/OFF switch]
Set this switch to ON to activate the long term reset mode.*
This switch is not related to the setting of the R/RST switch on the front panel.
Factory setting: OFF

* Long term reset mode: The reset mode in which the interval is longer than the usual restart reset mode. The charging start can be set at any timing in accordance to the reset pulse. The charging time depends on the input width of the external trigger.

Note about the DC-77RR/77RR-CE camera adaptor

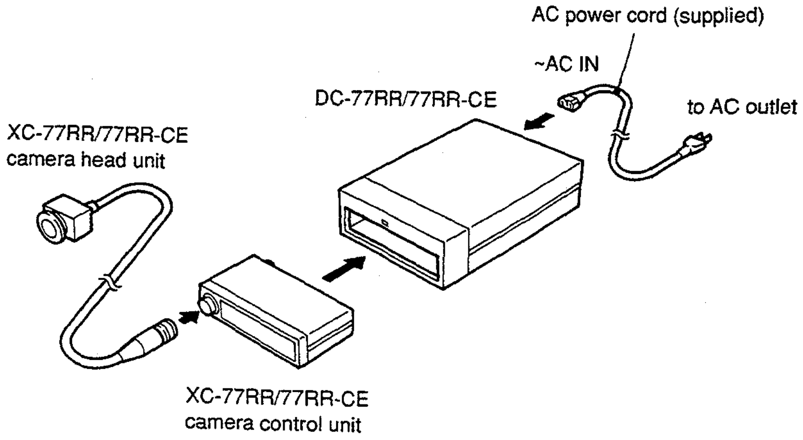
The DC-77RR/77RR-CE has 75 Ω termination switches for HD and VD signals.
If you set both 75 Ω termination switches on the DR-96 board and on the DC-77RR/77RR-CE to ON, the amplitude of the input signal becomes too low and the camera may not synchronize.
When the camera inputs the sync signal from the DC-77RR/77RR-CE, set the 75 Ω termination switches on the DR-96 board to OFF, and use the switches on the DC-77RR/77RR-CE.

1-6. Connections

1-6-1. Before Connection

- Be sure to turn off the units to be connected, or the parts in the units may be damaged.
- *To remove the connector, pull it out by the plug.* Never pull the cord itself.
- Connect the power cord after completing all other connections.

1-6-2. Installing XC-77RR/77RR-CE Joined with DC-77RR/77RR-CE

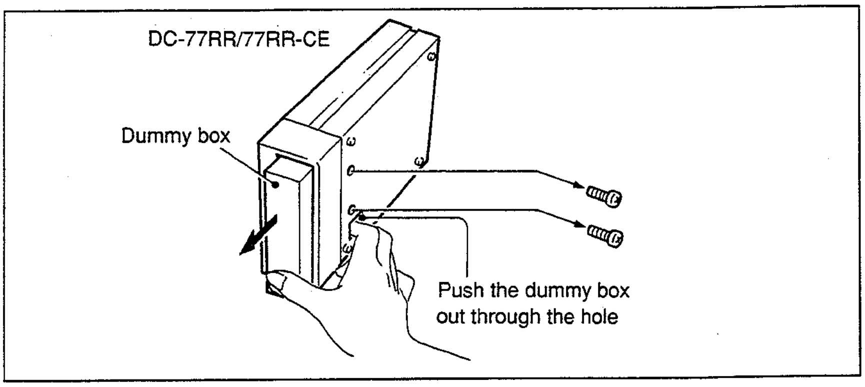

AC power cord (supplied)
~AC IN
DC-77RR/77RR-CE
to AC outlet
XC-77RR/77RR-CE
camera head unit
XC-77RR/77RR-CE
camera control unit

To extend the distance between the camera control unit and the camera head unit, use the CCXC-20P20 (20 m) extension cable.

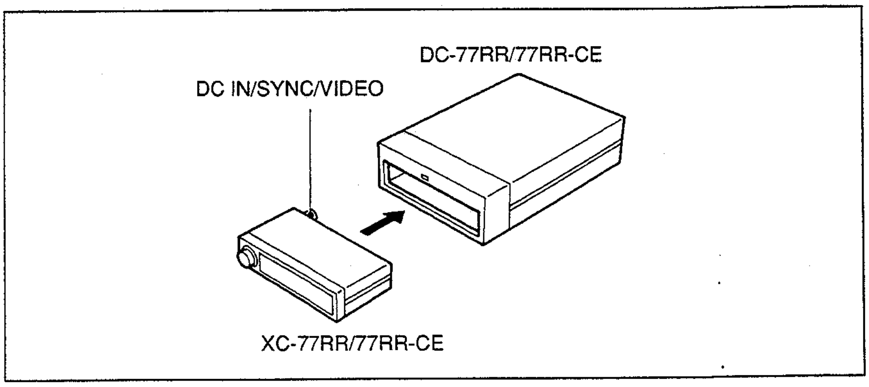
How to join the XC-77RR/77RR-CE and the DC-77RR/77RR-CE

Remove the dummy box from the DC-77RR/77RR-CE and insert the XC-77RR/77RR-CE into the DC-77RR/77RR-CE.

1 Remove the screws on the bottom, and push the dummy box out through the hole on the bottom of the DC-77RR/77RR-CE. (Keep the removed screws. You will need them again soon.)

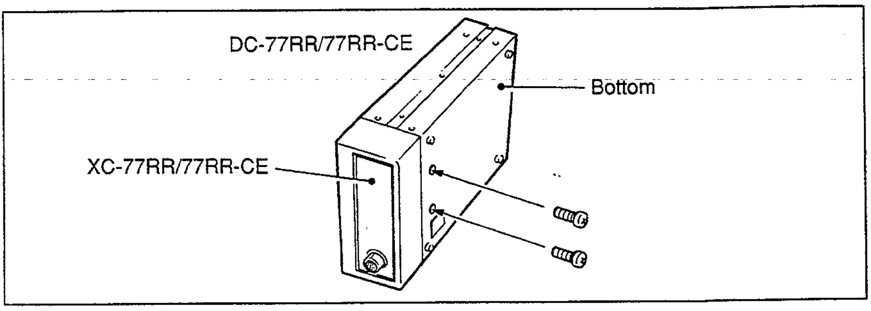

DC-77RR/77RR-CE
Dummy box
Push the dummy box out through the hole

2 Insert the XC-77RR/77RR-CE in the DC-77RR/77RR-CE.


DC-77RR/77RR-CE
DC IN/SYNC/VIDEO
XC-77RR/77RR-CE

Insert the XC-77RR/77RR-CE into the DC-77RR/77RR-CE completely so as to connect the DC IN/ SYNC/VIDEO connector of the XC-77RR/77RR-CE to the camera connector inside the DC-77RR/77RR-CE.

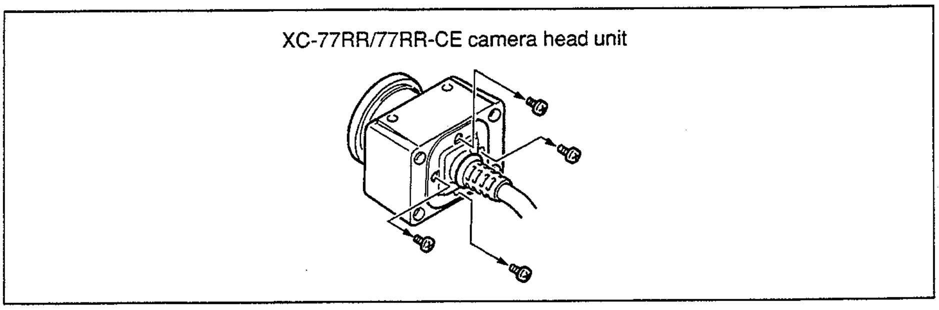
3 Screw the DC-77RR/77RR-CE through the screw hole on the bottom using the screws that you removed before.


DC-77RR/77RR-CE
Bottom
XC-77RR/77RR-CE

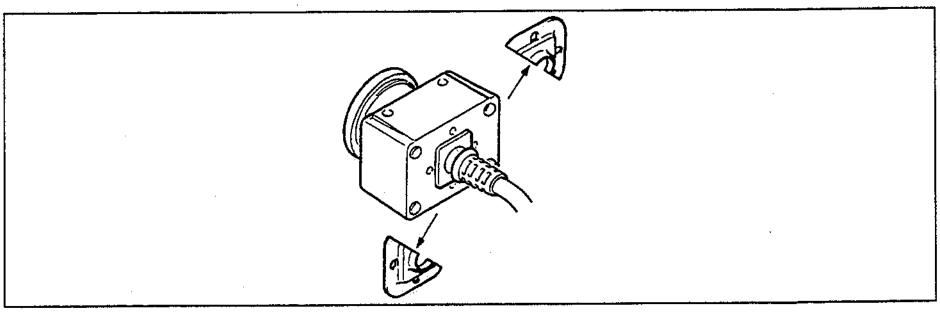
Changing the direction of the cable of the camera head unit

You can change the direction of the cable of the camera head unit toward up, down, right or left.

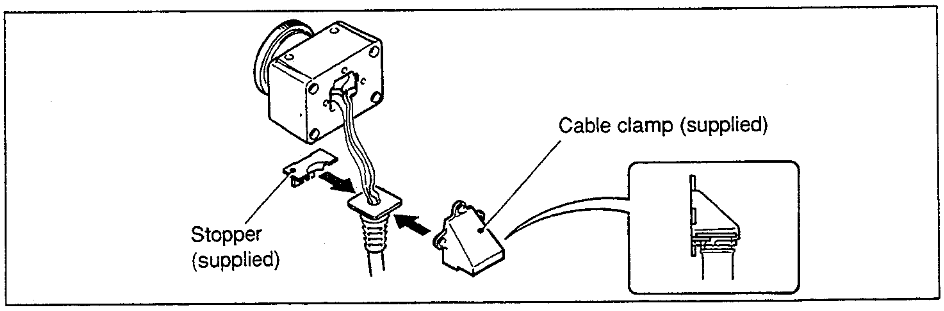
1


XC-77RR/77RR-CE camera head unit

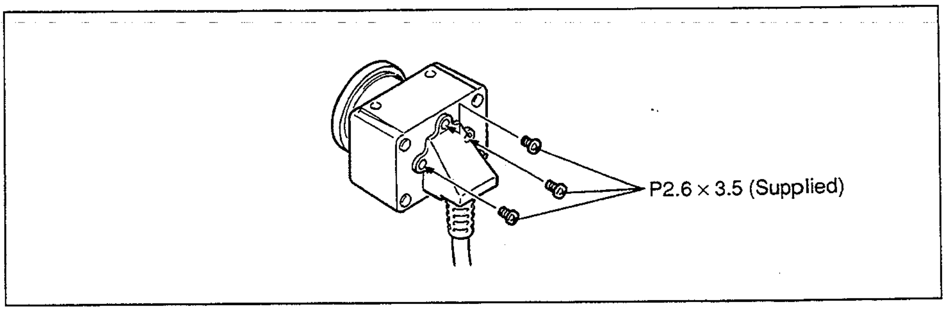
2



3


Cable clamp (supplied)
Stopper (supplied)

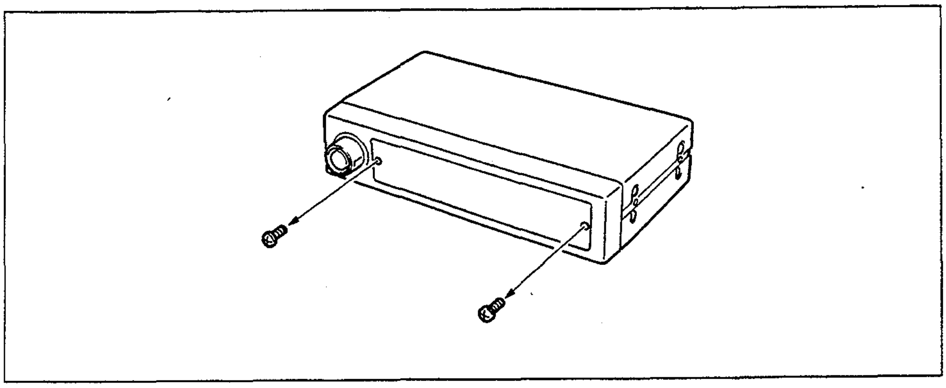
4


P2.6 × 3.5 (Supplied)

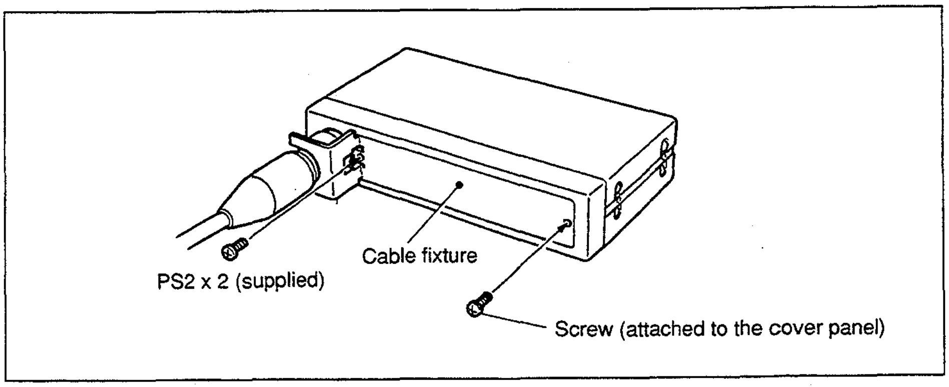
Fixing the CAMERA HEAD connector of the camera control unit

When the camera vibrates, horizontal lines appear on the reproduced picture. In this case, fix the CAMERA HEAD connector and the camera cable using the supplied cable fixture.

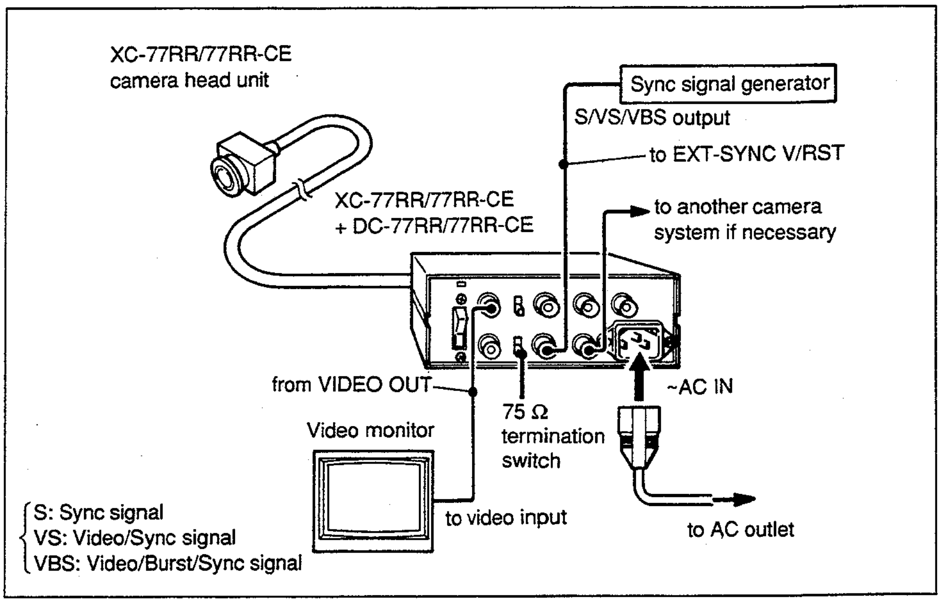
1 Remove the cover panel.



2 Fix the camera head connector using the cable fixture.


Cable fixture
PS2 x 2 (supplied)
Screw (attached to the cover panel)

1-6-3. Synchronizing the Camera with External S/VS/VBS Signal


XC-77RR/77RR-CE
camera head unit
Sync signal generator
S/VS/VBS output
to EXT-SYNC V/RST
XC-77RR/77RR-CE
+ DC-77RR/77RR-CE
to another camera system if necessary
from VIDEO OUT
~AC IN
75 Ω termination switch
Video monitor
to video input
to AC outlet
S: Sync signal
VS: Video/Sync signal
VBS: Video/Burst/Sync signal

Loop-through output

The camera adaptor has two EXT-SYNC V/RST (VD sync signal/reset pulse input/output) connectors. To operate the connected camera in the external sync system, input the reference signal to one of these connectors. The input signal is directly output from the other connector.

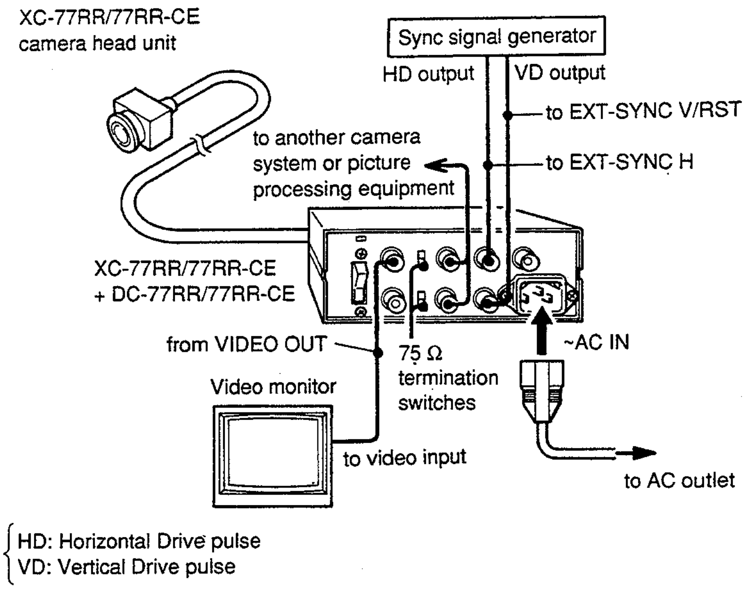
Two 75 Ω termination switches

There are two 75 Ω (ohm) termination switches for EXT-SYNC V/RST connectors, one on the camera adaptor and the other on the DR-96 board of the XC-77RR/77RR-CE camera. When the camera inputs the sync signal from the camera adaptor, set the switch on the DR-96 board to OFF (factory setting), and use the switch on the camera adaptor.

Note

If you set both 75 Ω termination switches on the DR-96 board and on the DC-77RR/77RR-CE to ON, the amplitude of the input signal becomes too low and the camera may not synchronize with the input signal.

1-6-4. Synchronizing the Camera with External HD and VD Signals


XC-77RR/77RR-CE
camera head unit
Sync signal generator
HD output
VD output
to EXT-SYNC V/RST
to another camera system or picture processing equipment
to EXT-SYNC H
XC-77RR/77RR-CE
+ DC-77RR/77RR-CE
from VIDEO OUT
75 Ω termination switches
~AC IN
Video monitor
to video input
to AC outlet
HD: Horizontal Drive pulse
VD: Vertical Drive pulse

Loop-through output

The camera adaptor has two EXT-SYNC V/RST (VD sync signal/reset pulse input/output) connectors. To operate the connected camera in an external sync system, input the reference signal to one of these connectors. The input signal is directly output from the other connector. This is true of the EXT-SYNC H (HD sync signal input/output) connectors.

75 Ω termination switches

There are two 75 Ω (ohm) termination switches for EXT-SYNC V/RST connectors, one on the camera adaptor and the other on the DR-96 board of the XC-77RR/77RR-CE camera. This is true of the EXT-SYNC H connectors. When the camera inputs the sync signal from the camera adaptor, set the switches on the DR-96 board to OFF (factory setting), and use the switches on the camera adaptor.

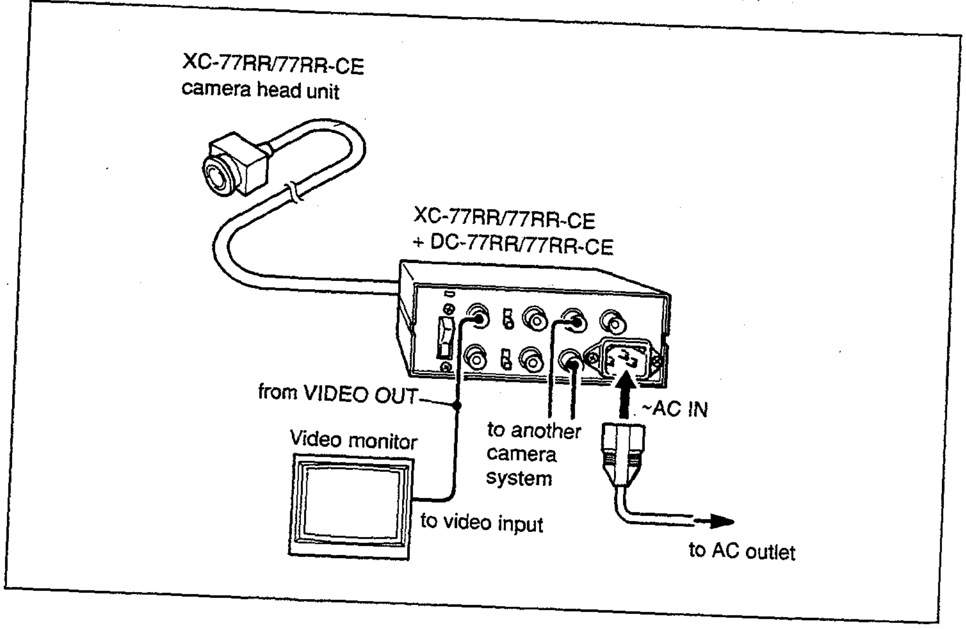
Note

If you set both 75 Ω termination switches on the DR-96 board and on the DC-77RR/77RR-CE to ON, the amplitude of the input signal becomes too low and the camera may not synchronize with the input signal.

1-6-5. Synchronizing Other Equipment with the Internal Sync Signal of XC-77RR/77RR-CE

To have the XC-77RR/77RR-CE output the internal sync signal (clock or HD/VD), change the settings of its internal switches. See "1-5. Internal Switch Settings of the Camera Control Unit" for details.

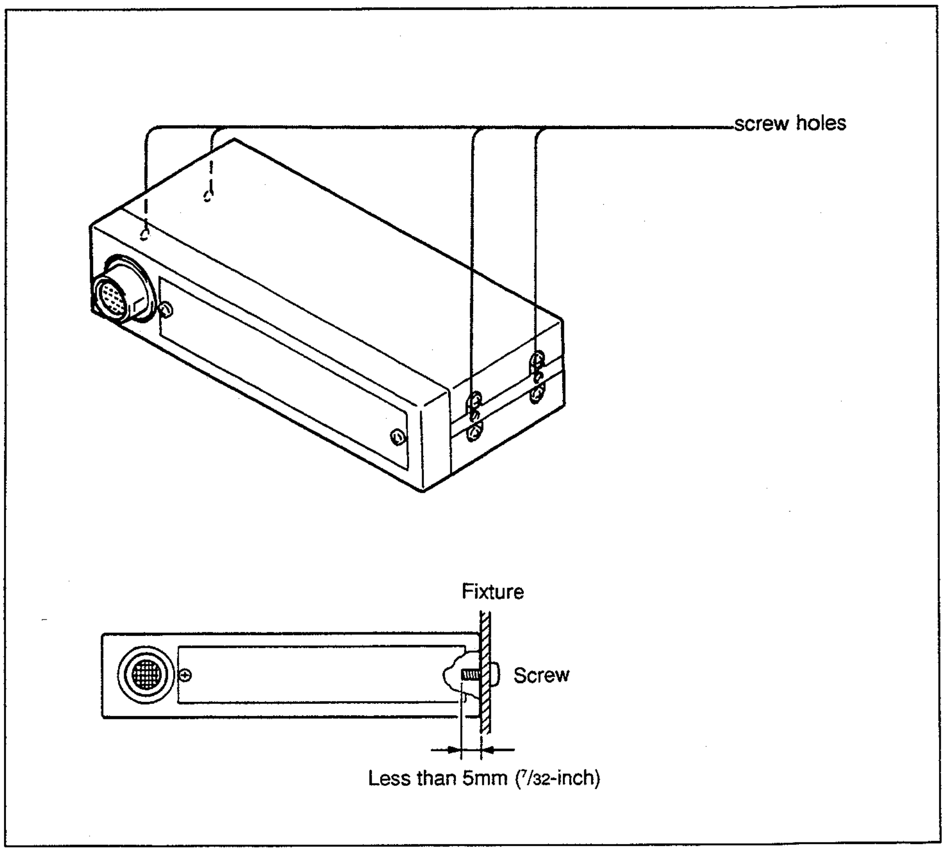
Since the synchronization signal (HD and VD) generated inside the XC-77RR/77RR-CE is the TTL level output, be sure to set the 75 Ω termination switch to OFF.


XC-77RR/77RR-CE
camera head unit
XC-77RR/77RR-CE
+ DC-77RR/77RR-CE
from VIDEO OUT
~AC IN
Video monitor
to another camera system
to video input
to AC outlet

1-6-6. About the Supplied Screws

Use the supplied screws for the purposes as shown below:
- To fix the cable clamp,
Three black screws (+P2.6× 3.5 type-1 precision)
- To fix the cable fixture of the CAMERA HEAD connector,
A black screw (+PS2× 6)

1-6-7. About the Length of the Screws Used to Mount the Camera Control Unit

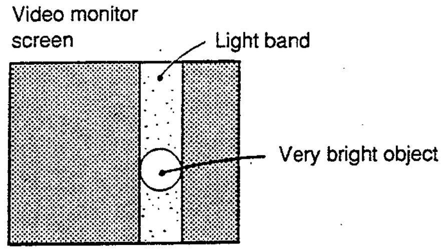

screw holes
Fixture
Screw
Less than 5mm (7/32-inch)

Do not use screws longer than the 5mm (7/32-inch) screw hole. Using longer screws may damage the inside of the camera control unit.

1-7. Special Characteristics of a CCD

Smear phenomenon

This phenomenon occurs when shooting a very bright object (such as electric light, fluorescent lamp, the sun or a strong refrection).



Due to the interline-transfer organization of the CCD image sensors, this phenomenon is caused by electronic charges generated deep inside the photosensors by light that has a long wavelength, such as infrared light.

False signal

When vertical bands or straight lines are shot, they may look wavy.

Blemishes

The photosensor elements generate electronic charges which ultimately produce horizontal and vertical rows in the CCD image sensor.

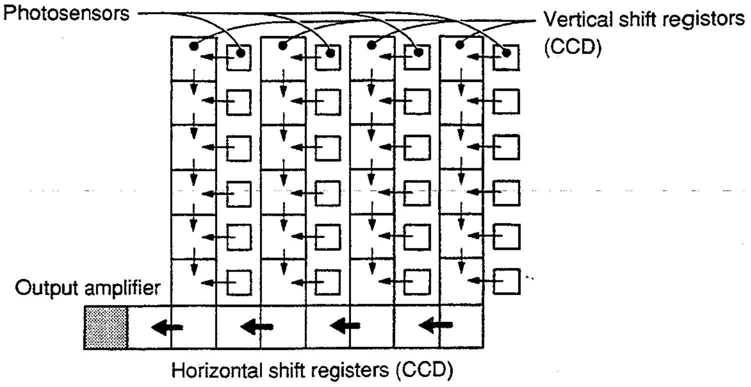
Therefore, any malfunctioning photosensor element will eventually cause a blemish on the monitor screen.

White micro spots

At high temperatures, a lot of small white spots may appear on the screen when you shoot a dark object.

The interline-transfer organization of the CCD image sensors

The XC-77RR/77RR-CE CCD video camera module adopts an interline-transfer organization in which precisely aligned photosensors and vertical shift registers are arrayed interlinearly and a horizontal shift resistor links up with the vertical shift registor, as shown. Light variations are sensed by the photosensors, which generate electronic charges proportional to the light intensity. The generated charges are fed into the vertical shift registers all at once. The charges are then transferred from the vertical shift registers to the horizontal shift registers successively and finally reach the output amplifier to be read out successively.


Photosensors
Vertical shift registors (CCD)
Output amplifier
Horizontal shift registers (CCD)

SECTION 2
COMPREHENSIVE SPECIFICATIONS

2-1. SPECIFICATIONS

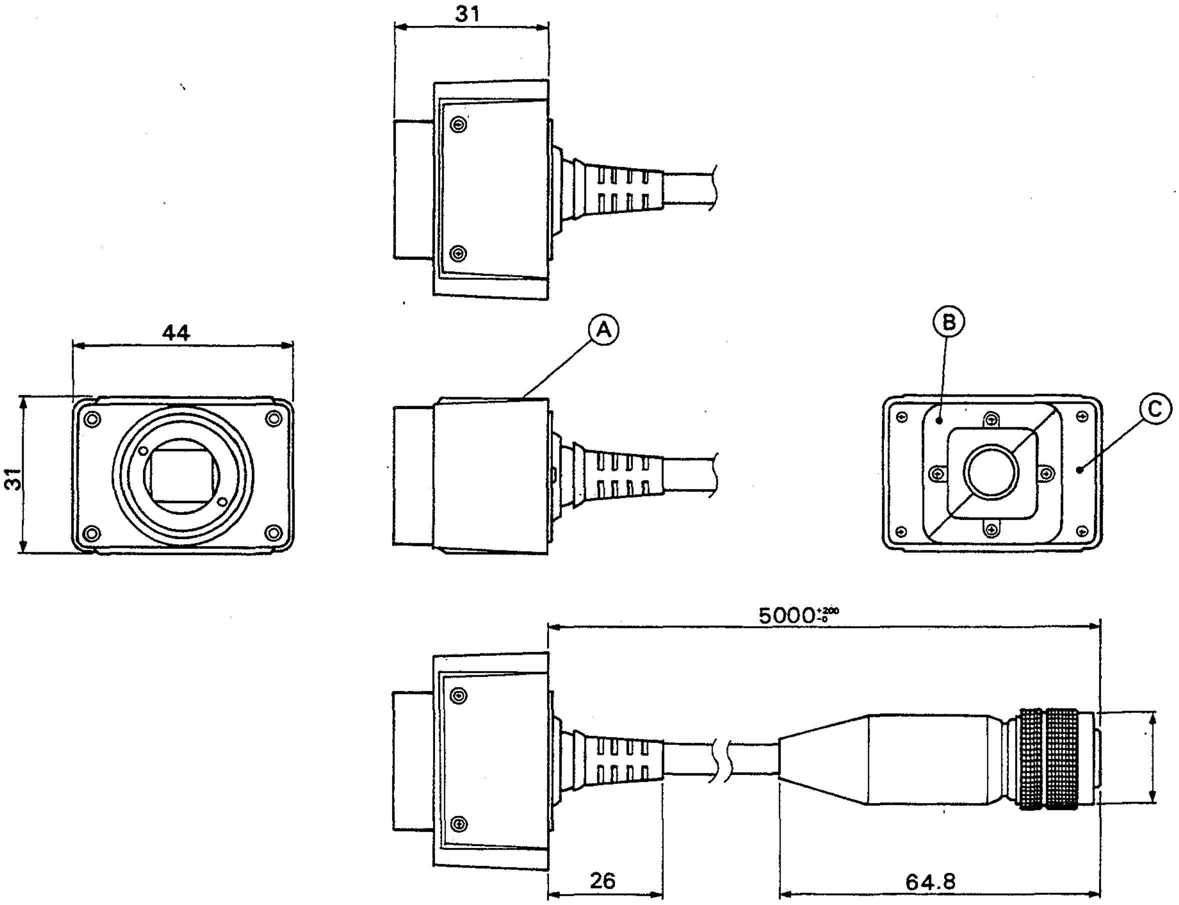
<XC-77RR CCD video camera module>

Pickup device	Interline transfer CCD
Picture elements	768 (H) x 493 (V)
Sensing area	8.8 x 6.6 mm (equivalent to the 2/3-inch camera tube)
Optical black	50 pixels each horizontal line
CCD vertical drive frequency	15.734 kHz ± 1%
CCD horizontal drive frequency	14.318 MHz
Signal system	EIA standard
Cell size	11 (H) x 13 (V) μm
Chip size	10.0 (H) x 8.2 (V) mm

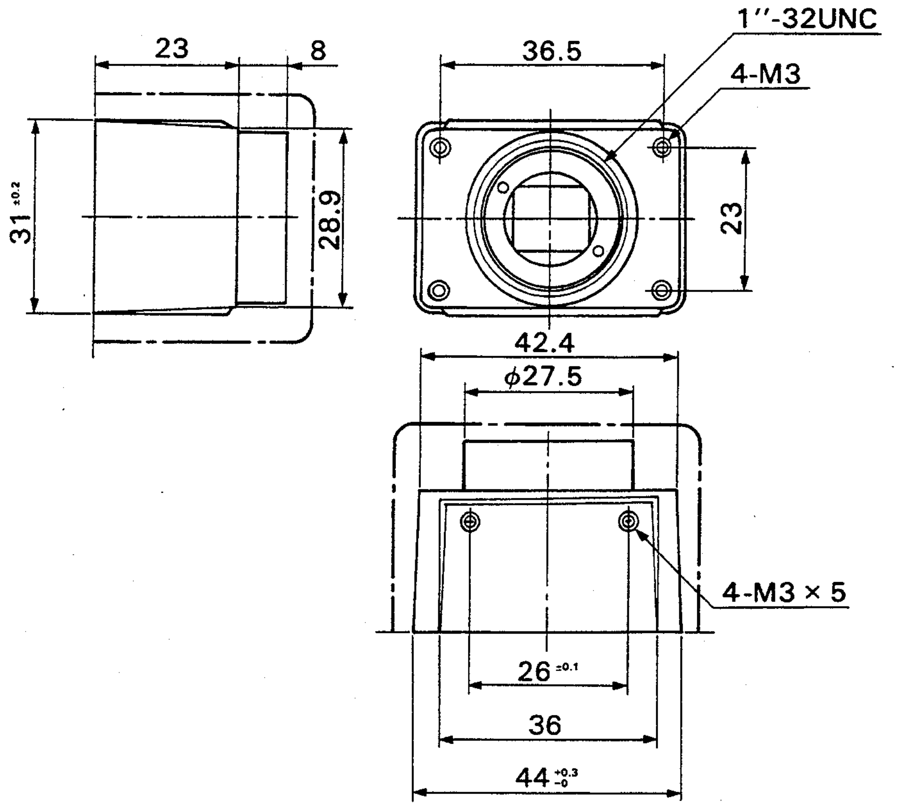
Optical and others

Lens mount	C mount
Flange back length	17.526 mm
Sync system	Internal/External, selectable with the internal switch
External sync input	S/VB/VBS (sync level: 0.3 Vp-p ± 6 dB) HD and VD (signal level: 2 to 5 Vp-p)
External sync frequency tolerance	± 1% (to horizontal sync frequency)
Jitter	Within ± 50 nsec
Scanning system	525 lines 2 : 1 interlace/non-interlace, selectable with the internal switch
Video output	1.0 Vp-p sync negative, 75 Ω unbalanced
Horizontal resolution	570 TV lines
Vertical effective lines	2 : 1 interlace 485 lines
Sensitivity	400-lux with F4 (γ ON/0 dB)
Minimum illumination	5.0-lux with (AGC: ON, F1.4, γ ON)
S/N ratio	56 dB
Gain	Auto gain control/fixed gain, selectable with the switch
Gamma	Gamma correction/gamma = 1, selectable with the switch
White clip	110 IRE ± 10 IRE/140 IRE ± 10 IRE, selectable with the switch
Charge mode	Frame/Field, selectable with the switch
Shutter mode	Normal shutter mode/DONPISHA shutter mode, selectable with the switch
Shutter speed	Normal shutter mode: 1/63 to 1/3,580,000 sec. DONPISHA shutter mode: 1/3.6 to 1/2200 sec.
Power requirement	12 V DC
Power voltage tolerance	10.5 to 15 V DC
Power consumption	5.5 W
Operating temperature	−5 to + 45°C (+ 23 to + 113°F)
Storage temperature	− 25 to + 60°C (− 13 to + 140°F)
Operating humidity	20 to 80% (without condensation)
Storage humidity	20 to 95% (without condensation)
Shock resistance	70 G
High vibration resistance	7G
Dimension	Camera head unit: 44 x 31 x 23 mm (w/h/d), ($1\frac{3}{4}$ x $1\frac{1}{4}$ x $\frac{29}{32}$ inches), not including the cable Camera control unit: 135 x 30 x 70 mm (w/h/d), ($5\frac{3}{8}$ x $1\frac{3}{16}$ x $2\frac{7}{8}$ inches)
Weight	Camera head unit: About 400 g (14 oz), including the cable Camera control unit: About 370 g (13 oz)
Supplied accessory	Lens mount cap (1) Cable clamp (1 set) Stopper (1) Cable fixture (1 set) Operation manual (1)

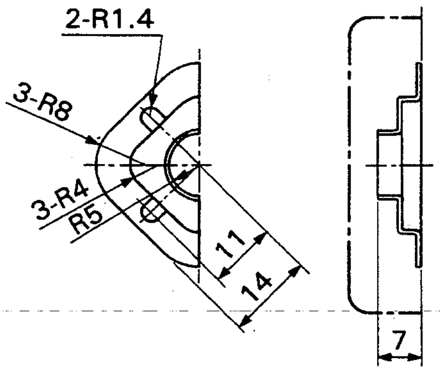
DIMENSIONS: (unit: mm)
CAMERA MODULE <XC-77RR>
CAMERA HEAD UNIT


31
44
31
A
B
C
5000 +200 -0
26
64.8

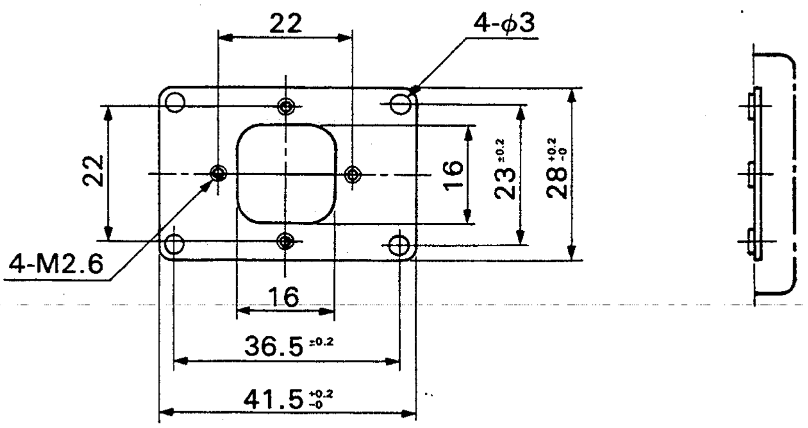
Ⓐ


23
8
31 ±0.2
28.9
36.5
1″-32UNC
4-M3
23
42.4
φ27.5
4-M3 × 5
26 ±0.1
36
44 +0.3 −0

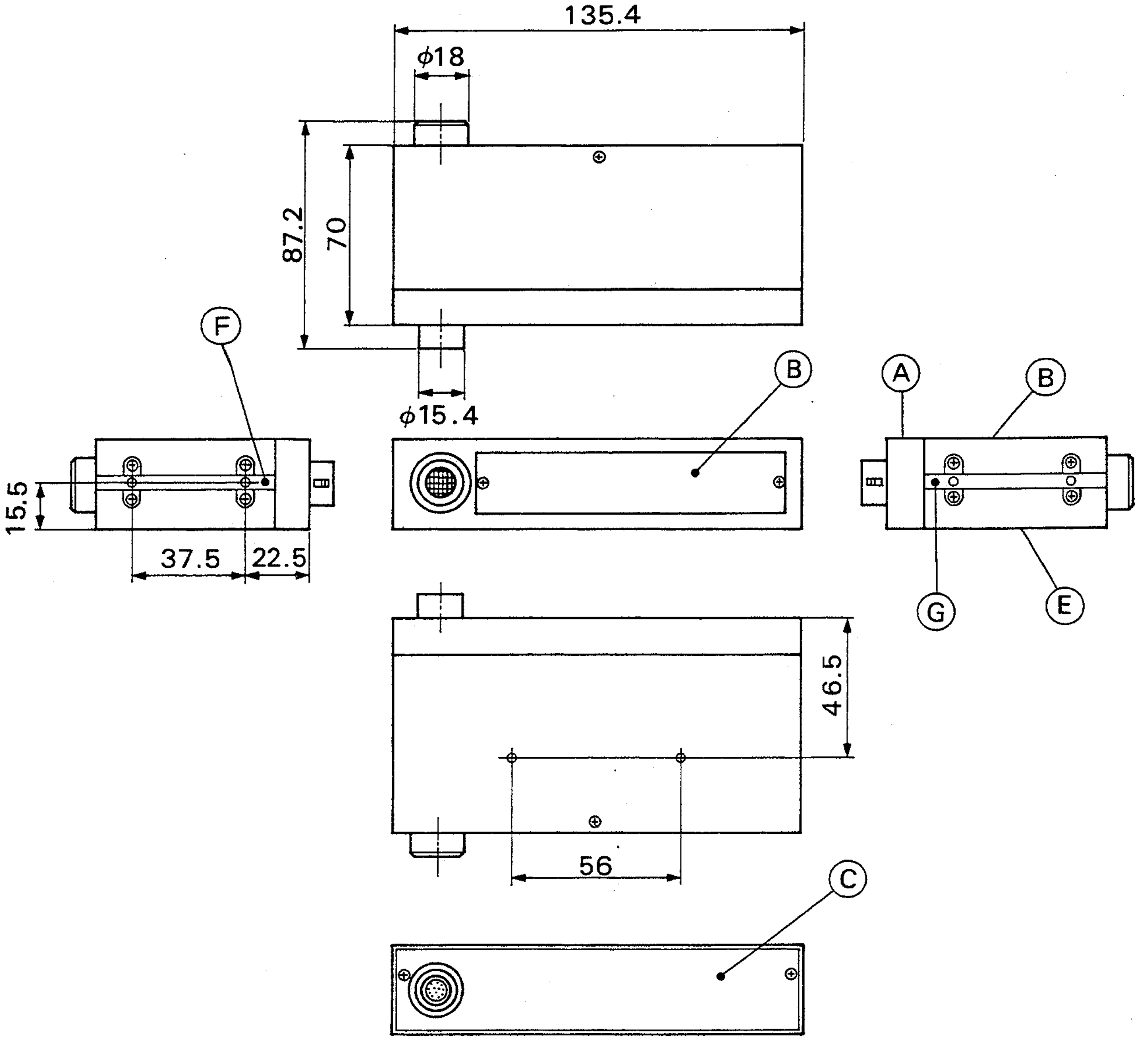
Ⓑ


2-R1.4
3-R8
3-R4
R5
11
14
7

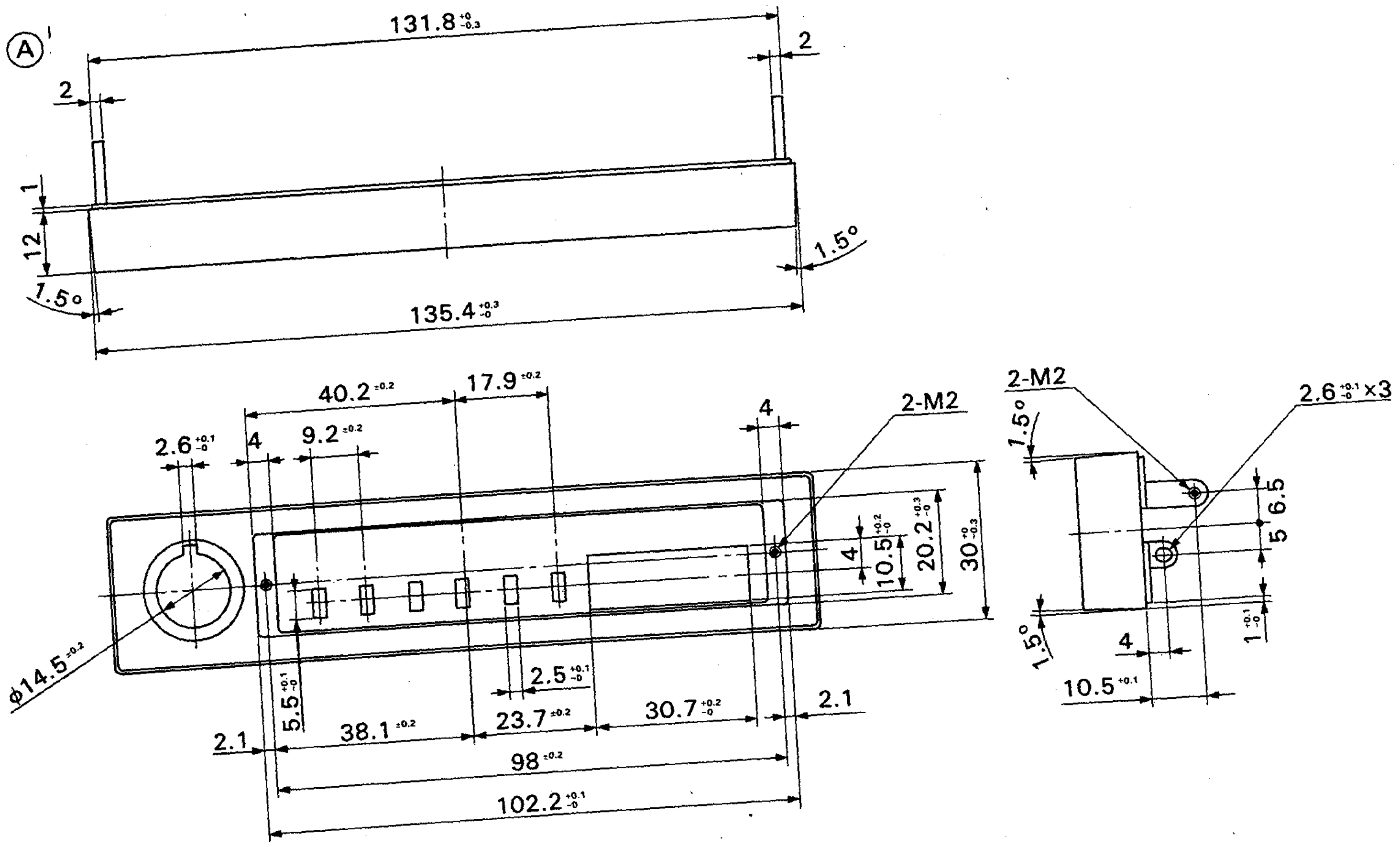
Ⓒ


22
4-φ3
22
16
23 ±0.2
28 +0.2 −0
4-M2.6
16
36.5 ±0.2
41.5 +0.2 −0

CAMERA CONTROL UNIT

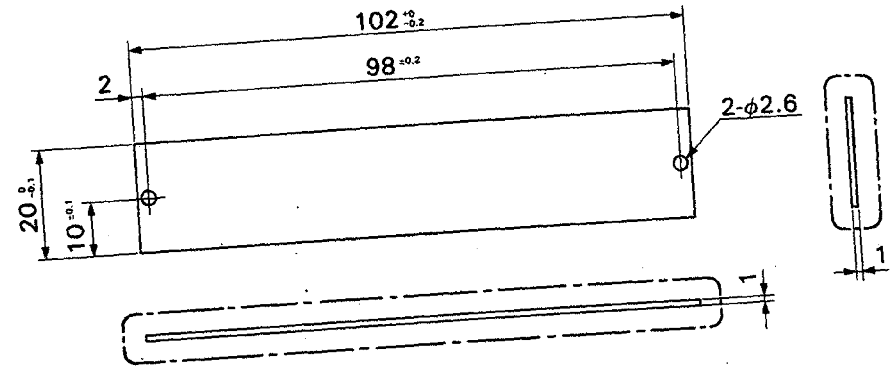

135.4
φ18
87.2
70
φ15.4
F
B
A
B
15.5
37.5
22.5
G
E
46.5
56
C

Ⓐ



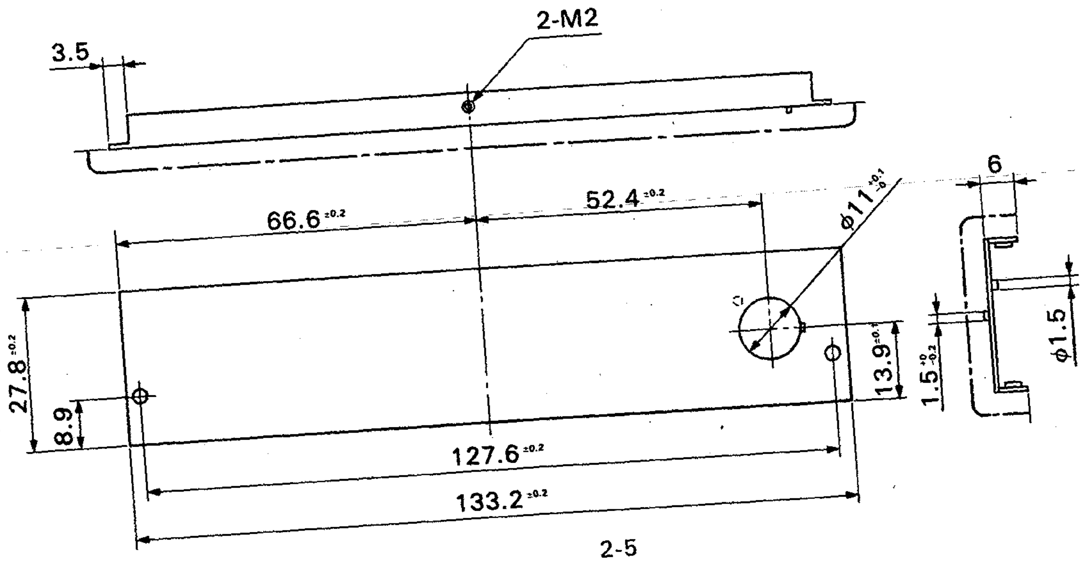
131.8
2
2
1
12
1.5°
1.5°
135.4
40.2
17.9
2.6
4
9.2
4
2-M2
4
10.5
20.2
30
φ14.5
5.5
2.5
2.1
38.1
23.7
30.7
2.1
98
102.2
2-M2
1.5°
2.6×3
6.5
5
1.5°
4
1
10.5

Ⓑ



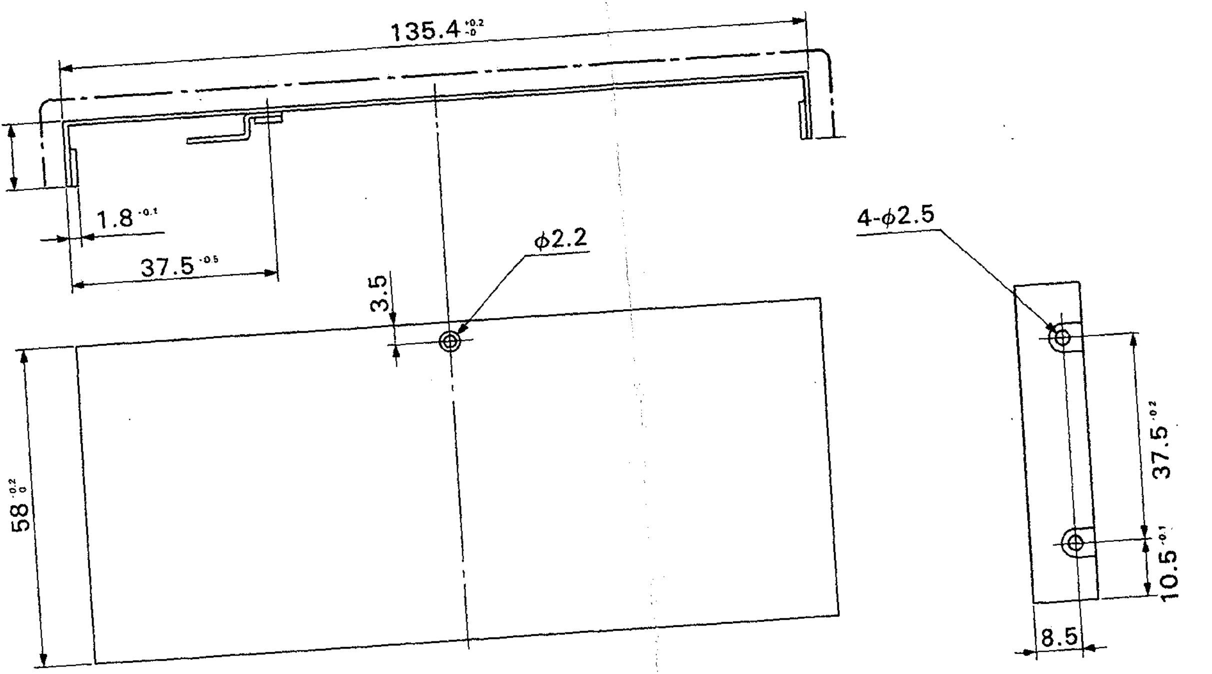
2-φ2.6

Ⓒ



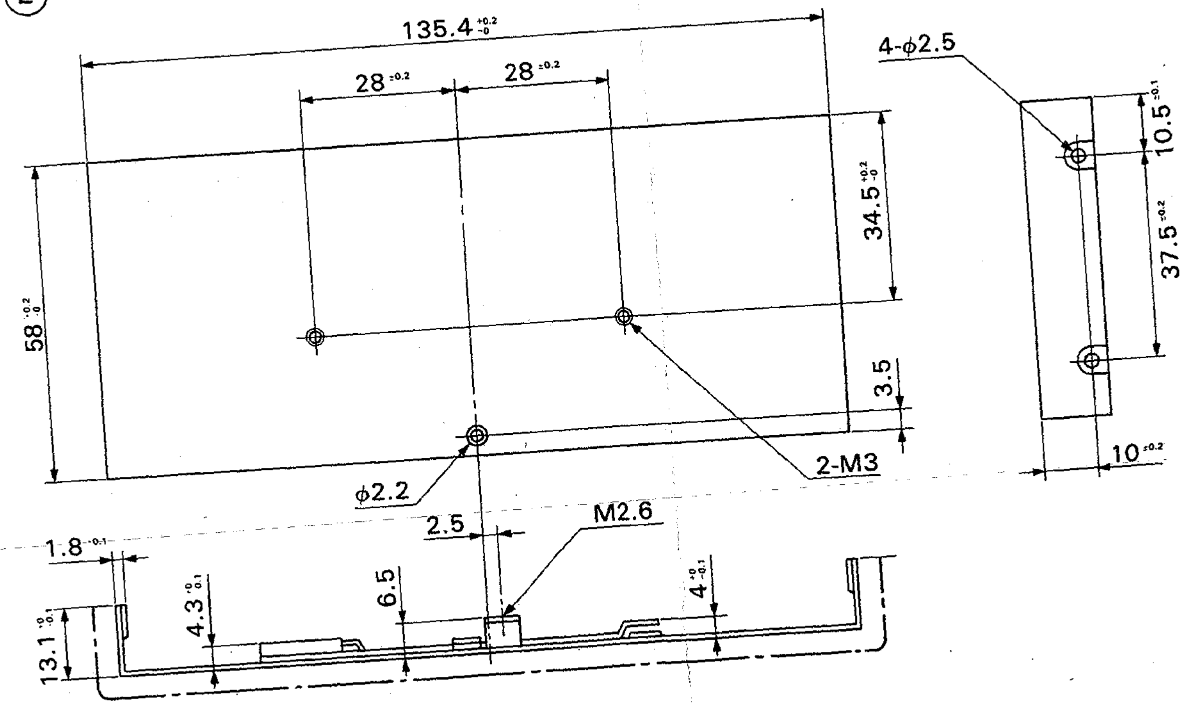
3.5
2-M2
66.6
52.4
φ11
6
27.8
8.9
13.9
1.5
φ1.5
127.6
133.2

Ⓓ



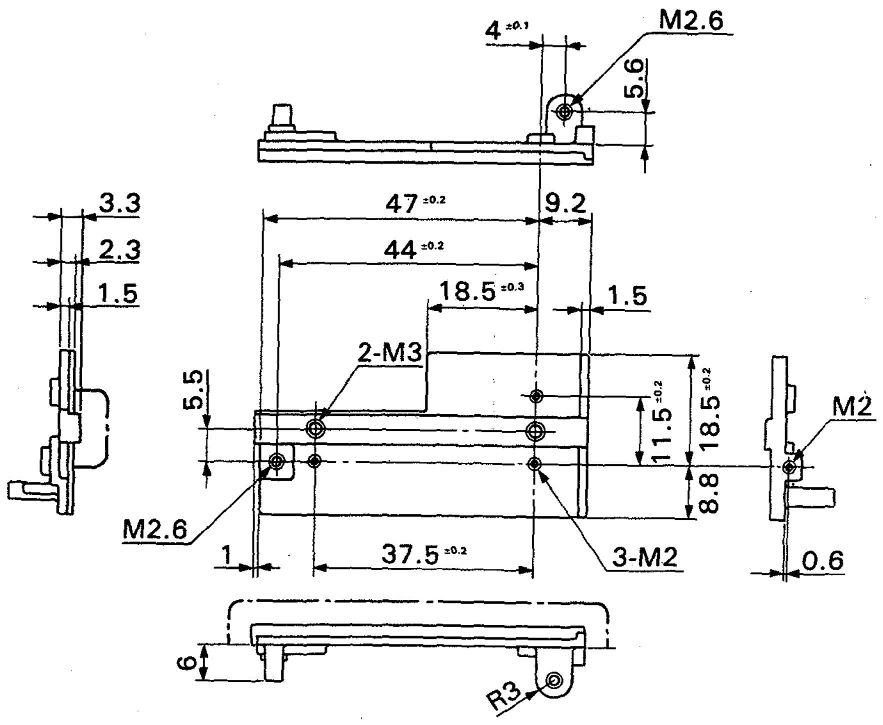
135.4
12.1
1.8
37.5
3.5
φ2.2
4-φ2.5
58
37.5
10.5
8.5

Ⓔ



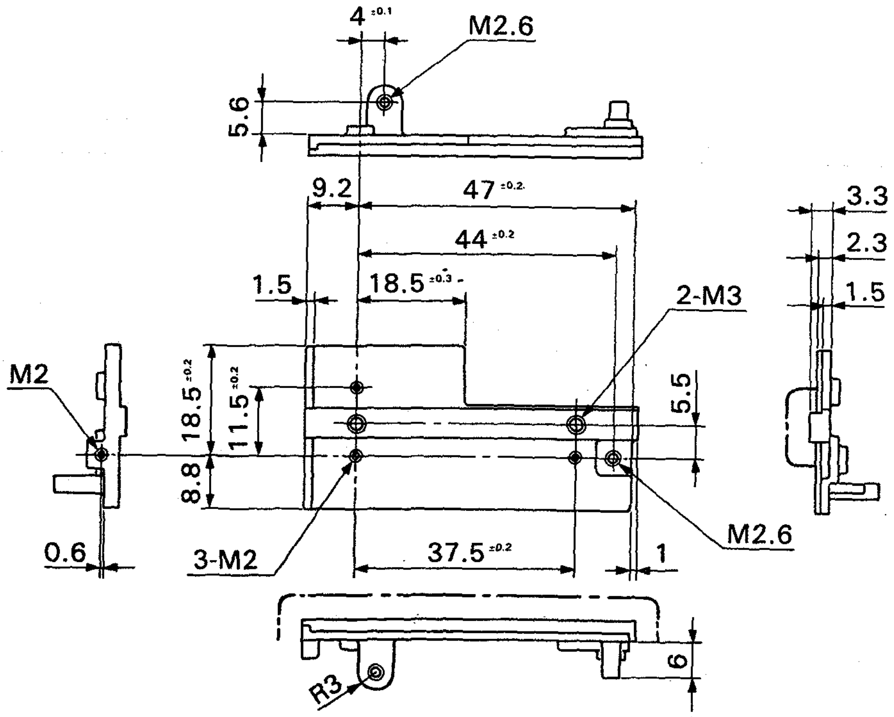
135.4
4-φ2.5
28
28
10.5
34.5
37.5
58
3.5
φ2.2
2-M3
10
1.8
2.5
M2.6
13.1
4.3
6.5
4

Ⓕ



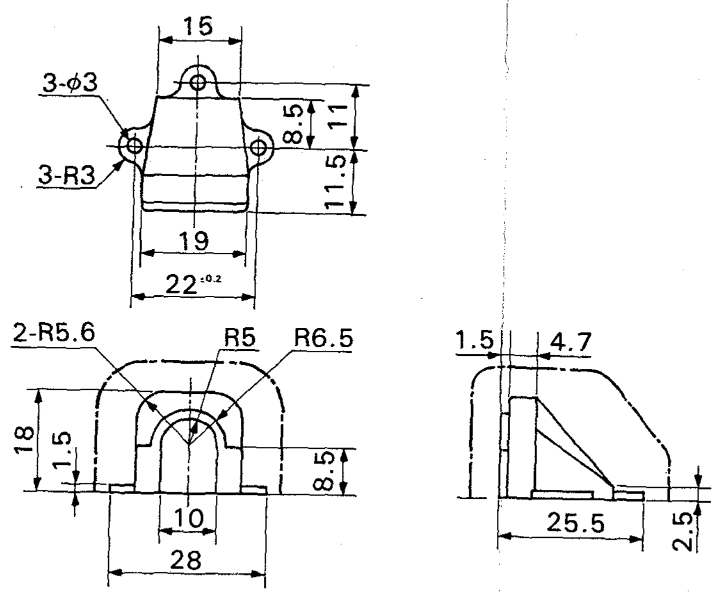
4 ±0.1
M2.6
5.6
3.3
2.3
1.5
47 ±0.2
9.2
44 ±0.2
18.5 ±0.3
1.5
2-M3
5.5
11.5 ±0.2
18.5 ±0.2
8.8
M2
M2.6
1
37.5 ±0.2
3-M2
0.6
6
R3

Ⓖ



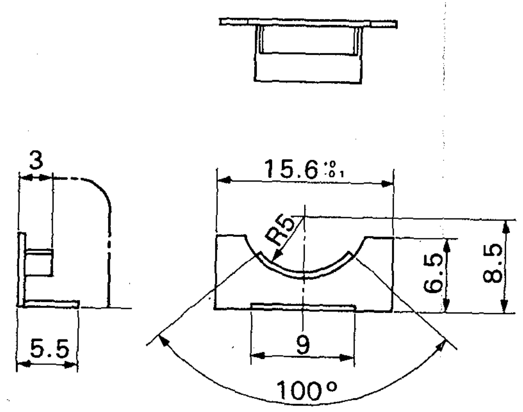
4 ±0.1
M2.6
5.6
9.2
47 ±0.2
44 ±0.2
3.3
2.3
1.5
1.5
18.5 ±0.3
2-M3
M2
18.5 ±0.2
11.5 ±0.2
5.5
8.8
0.6
3-M2
37.5 ±0.2
1
M2.6
R3
6

Cable clamp



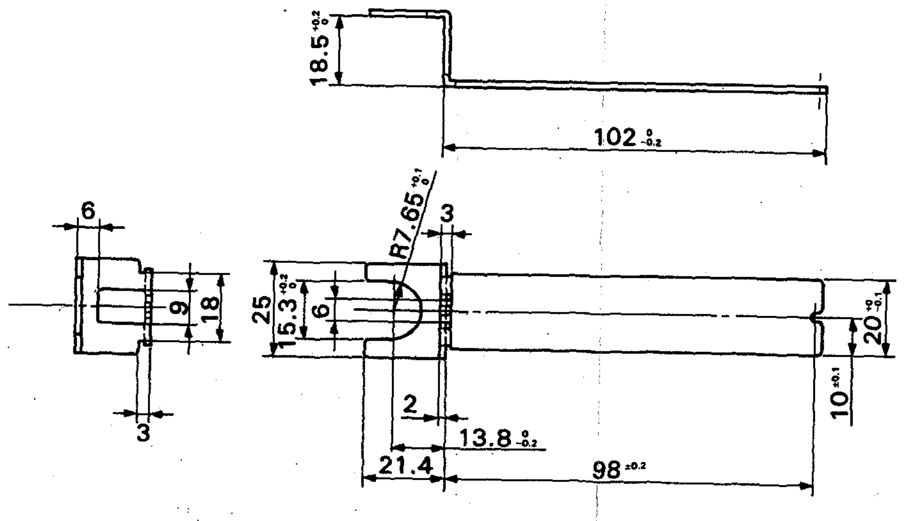
15
3-φ3
3-R3
8.5
11
11.5
19
22 ±0.2
2-R5.6
R5
R6.5
18
1.5
8.5
10
28
1.5
4.7
25.5
2.5

Stopper



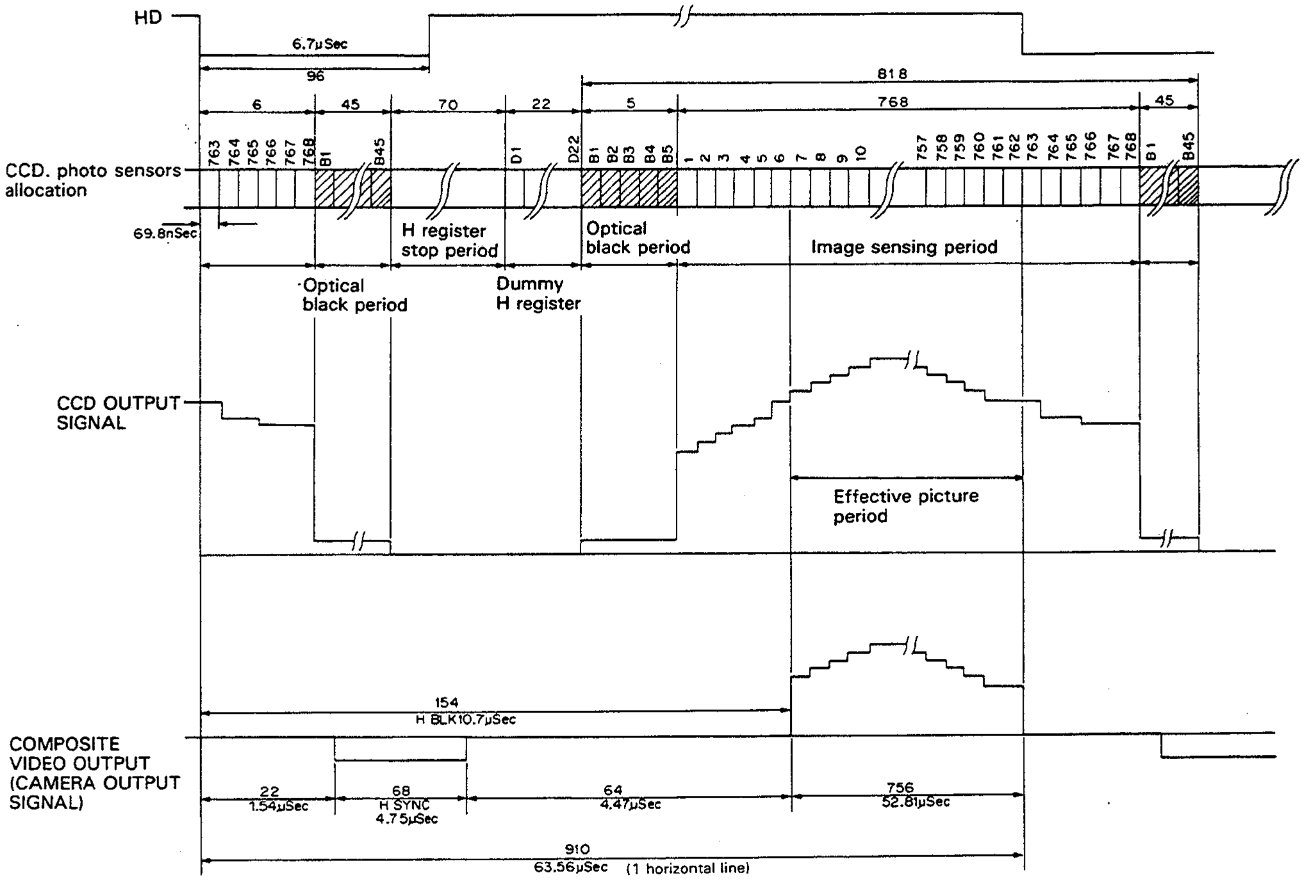
3
15.6 +0 -0.1
R5
6.5
8.5
5.5
9
100°

Cable fixture



18.5 ±0.2
102 +0 -0.2
6
R7.65 +0.1 0
3
25
15.3 ±0.2
6
9
18
20 +0 -0.1
10 ±0.1
3
2
13.8 +0 -0.2
21.4
98 ±0.2

2-2. OUTPUT SIGNAL TIMING CHART


HD
6.7µSec
96
818
6
45
70
22
5
768
45
763 764 765 766 767 768 B1 B45 D1 D22 B1 B2 B3 B4 B5 1 2 3 4 5 6 7 8 9 10 757 758 759 760 761 762 763 764 765 766 767 768 B1 B45
CCD. photo sensors allocation
69.8nSec
H register stop period
Optical black period
Image sensing period
Optical black period
Dummy H register
CCD OUTPUT SIGNAL
Effective picture period
154
H BLK10.7µSec
COMPOSITE VIDEO OUTPUT (CAMERA OUTPUT SIGNAL)
22
1.54µSec
68
H SYNC
4.75µSec
64
4.47µSec
756
52.81µSec
910
63.56µSec (1 horizontal line)

2-3. EXTERNAL SYNCHRONIZATION

There are three external synchronization modes:

1. S/VS/VBS mode
2. HD and VD mode
3. RESTART RESET mode

2-3-1. S/VS/VBS Mode

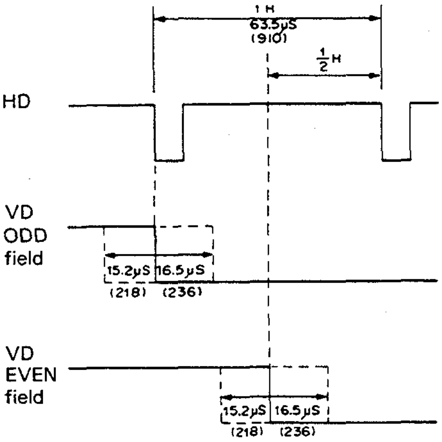
The S/VS/VBS mode provides external synchronization by supplying a normal composite signal, S, VS or VBS, to pin 7 of the 12-pin connector.

2-3-2. HD and VD Mode

The HD and VD mode provides external synchronization by supplying an HD signal to pin 6 and a VD signal to pin 7 of the 12-pin connector.

- **Input conditions of HD and VD signals**
- Frequency (period)
  HD: 15.734 KHz ± 1% (63.56 μs ± 1%)
  VD: 244 to 1023 1/2 H
  *The maximum number of vertical effective lines is 496 in the interlace mode.
  In the non-interlace mode, it is 246 for both the ODD field and the EVEN field.

- Phase



The figure in parentheses ( ) indicates the number of clock pulses

As shown in the illustration above, the ODD field is provided when the phase shift between the trailing edge of the VD signal and the trailing edge of the HD signal is between a lead of 15.2 μs and a lag of 16.5 μs. The EVEN field is provided when the phase shift between the trailing edge of the VD signal and the point 1/2H from the trailing edge of the HD signal is between a lead of 15.2 μs and a lag of 16.5 μs.

- **Interlace and non-interlace**

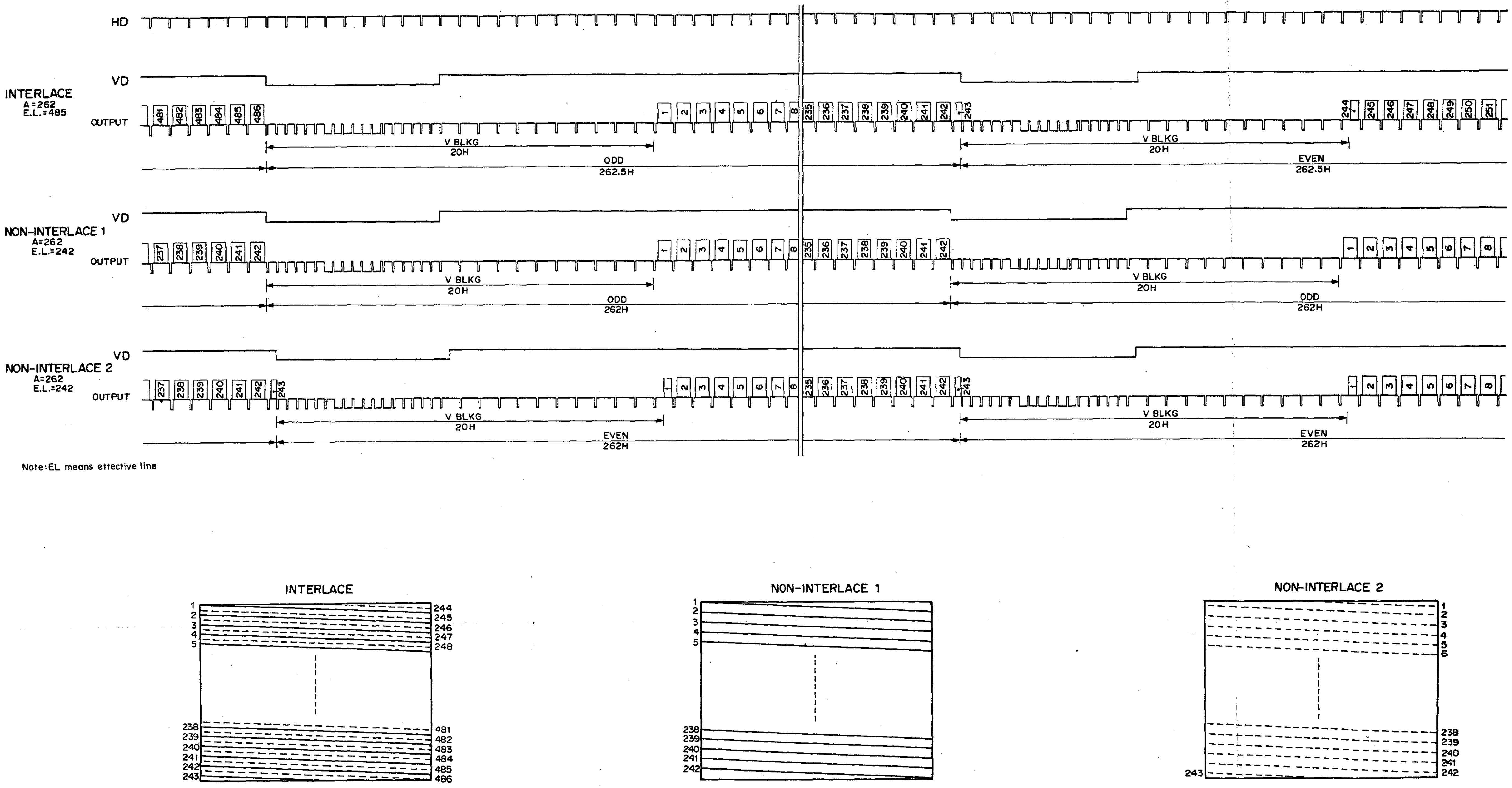
Operation can be performed in either interlace or non-interlace mode by changing the input condition of the VD signal. See Figure 1.

- Interlace

To operate in the interlace mode, set the period of the VD signal to (A + 1/2) H.A is an integer, 244 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is changed for each VD signal. The field changes from ODD to EVEN and to ODD, repeatedly during operation in the interlace mode. At this time, the number of scanning lines per frams is 2A + 1.

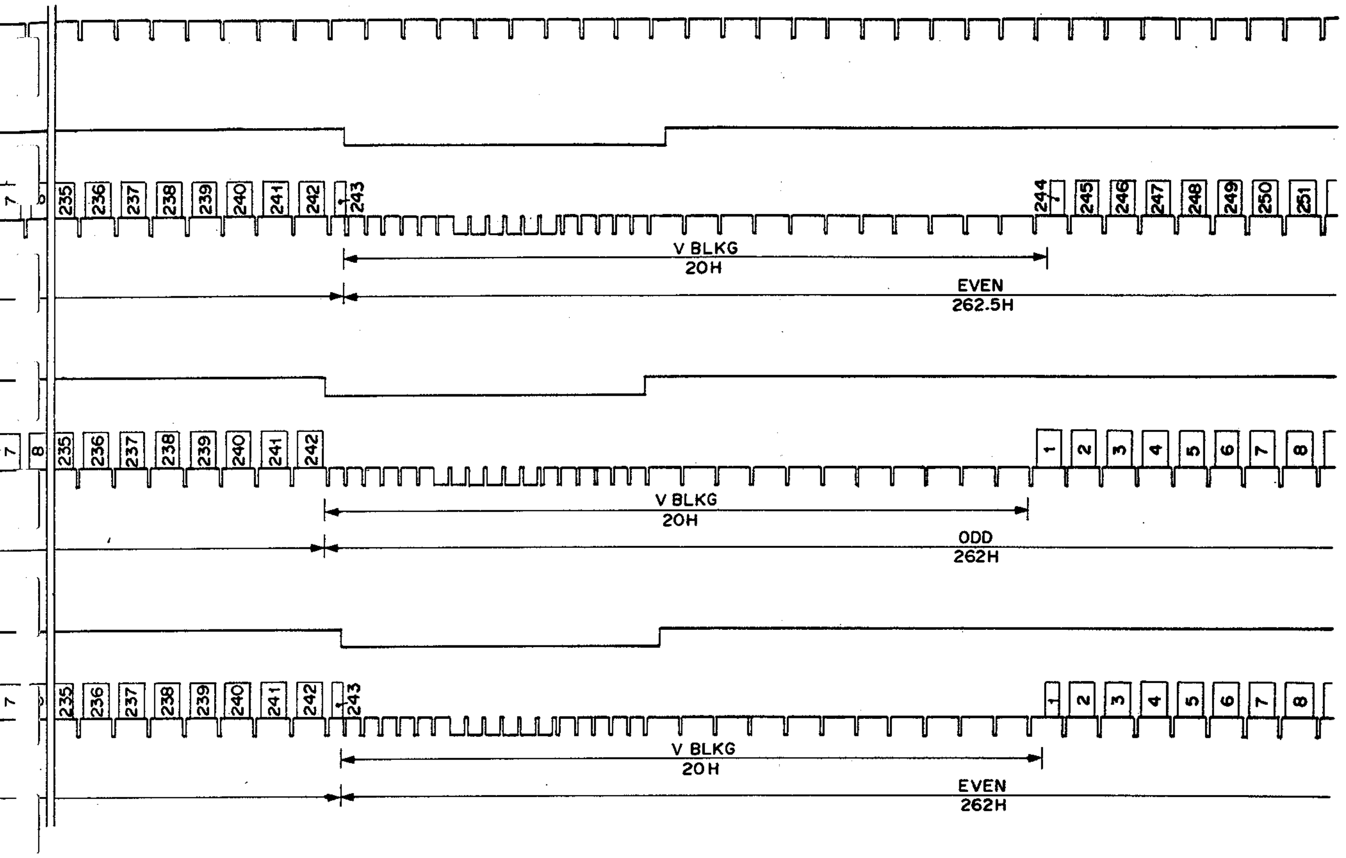
- Non-interlace

To operate in the non-interlace mode, set the period of the VD signal to A H. A is an integer, 244 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is not changed for each VD signal, and the field ODD or EVEN remains unchanged for operation in the non-interlace mode. The number of scanning lines is A; this is half of the number of scanning lines for operation in the interlace mode. The sensitivity is half of the sensitivity provided in the interlace mode, when the frame is stored. See Figure 2.

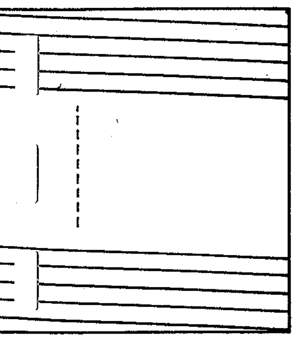

HD
VD
INTERLACE
A=262
E.L.=485
OUTPUT
481
482
483
484
485
486
1
2
3
4
5
6
7
8
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
V BLKG
20H
ODD
262.5H
EVEN
262.5H
NON-INTERLACE 1
A=262
E.L.=242
ODD
262H
NON-INTERLACE 2
A=262
E.L.=242
EVEN
262H
Note:EL means effective line
INTERLACE
NON-INTERLACE 1
NON-INTERLACE 2

[Fig. 1]

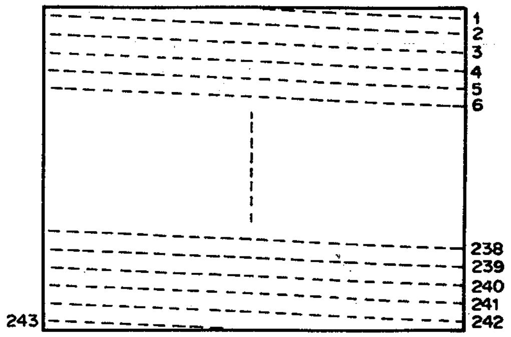
Read out mod
Scanning mo
Scanni
Storage time VIDEO OUT c
Vertical effec (TV lines)
RESTART
Features and application

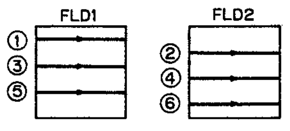
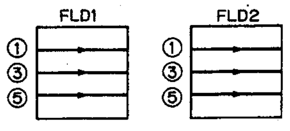
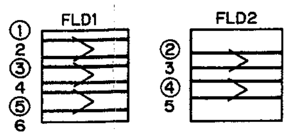
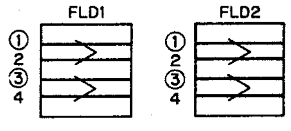
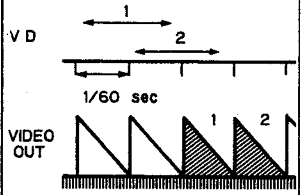
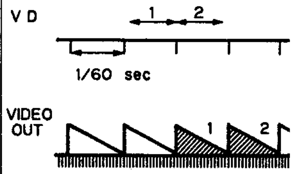
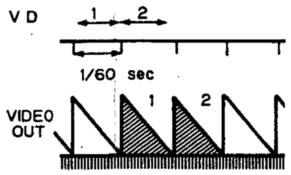
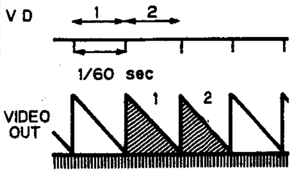
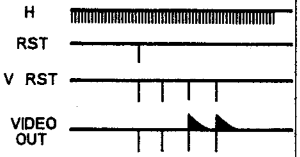
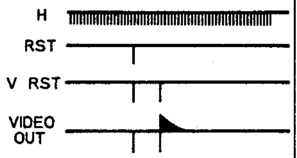
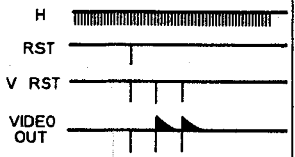
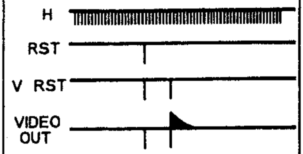

235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
V BLKG
20H
EVEN
262.5H
V BLKG
20H
ODD
262H
1
2
3
4
5
6
7
8
V BLKG
20H
EVEN
262H

-INTERLACE 1

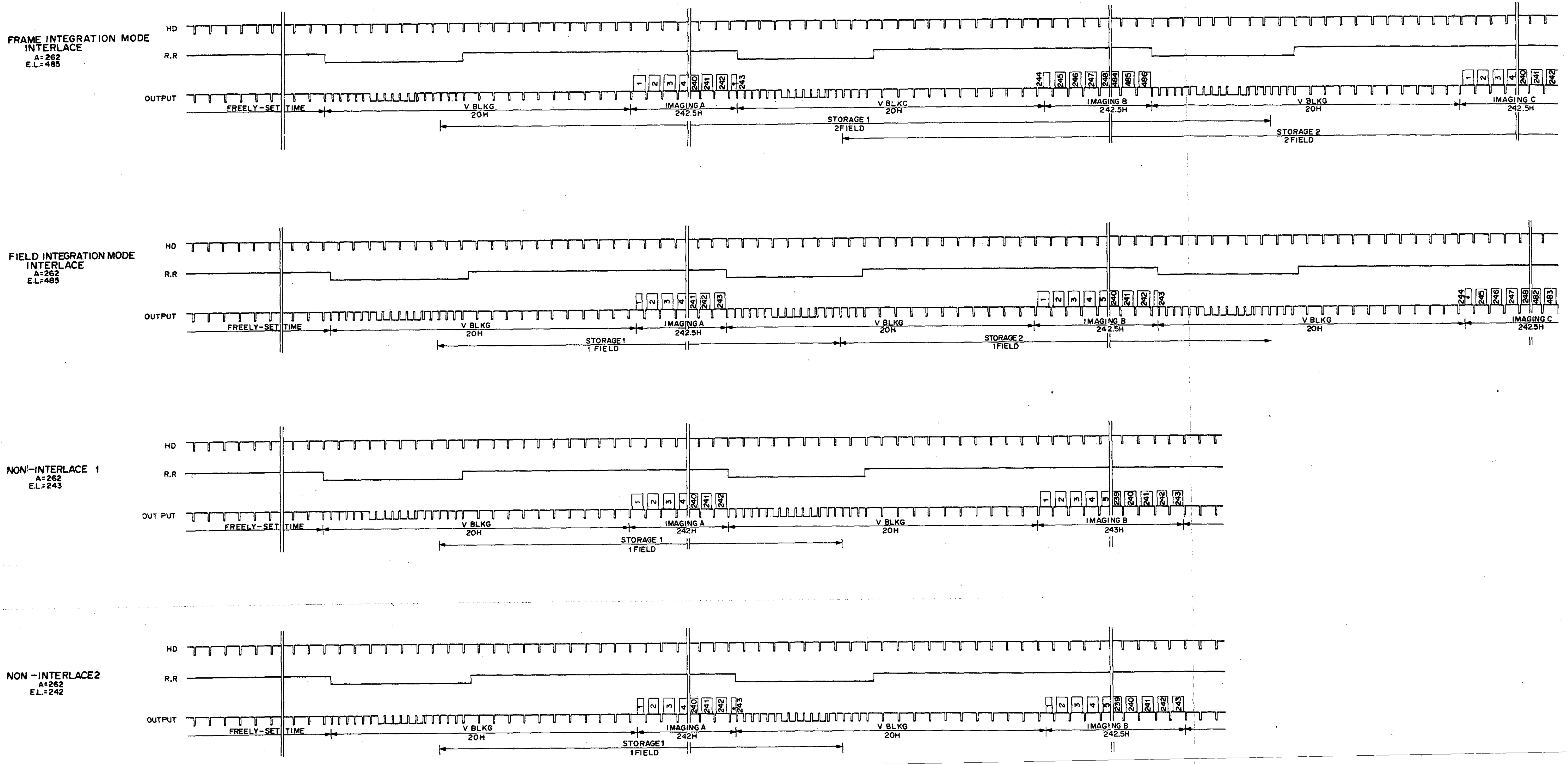


NON-INTERLACE 2

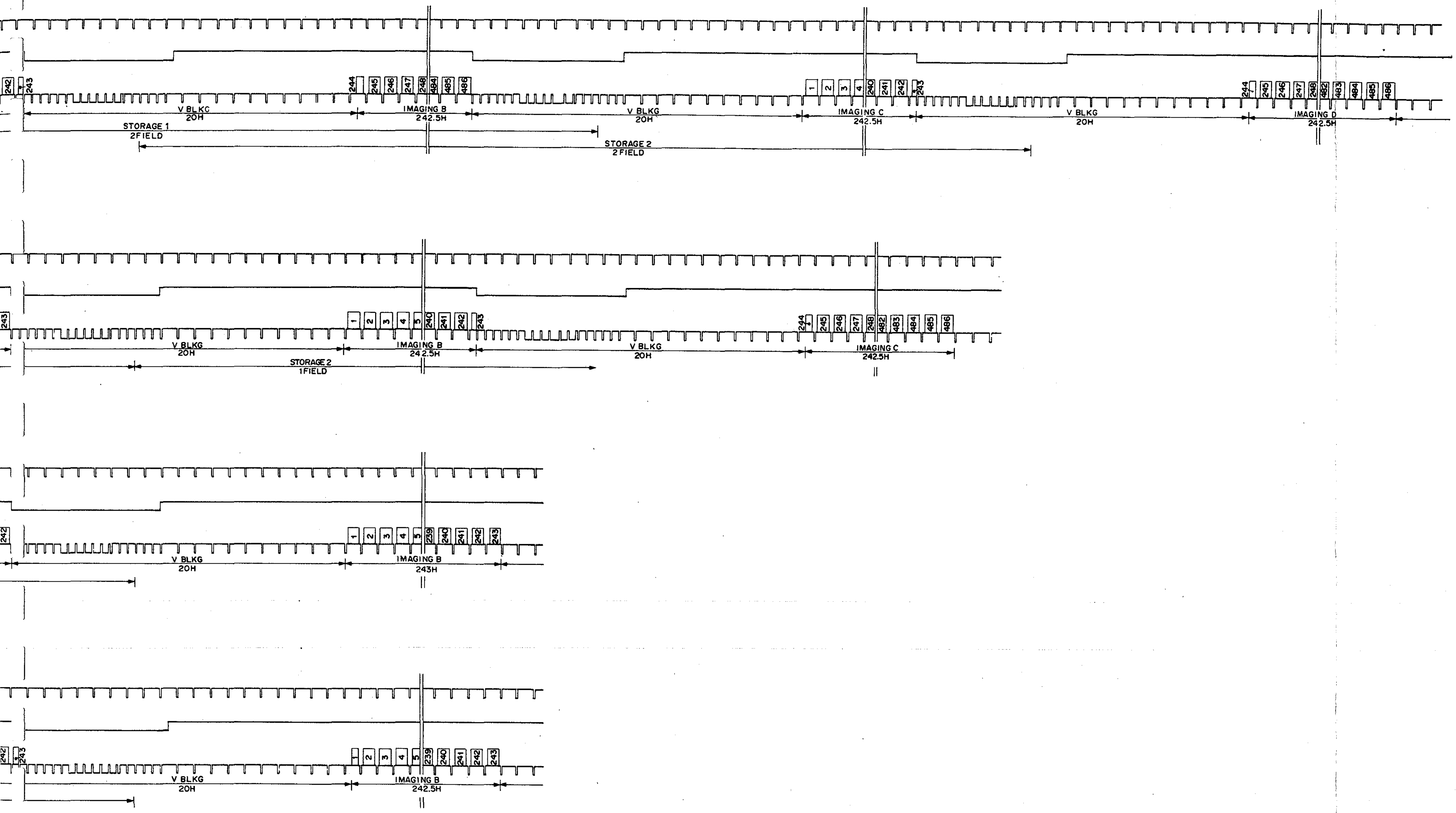

1
2
3
4
5
6
238
239
240
241
242
243

Read out mode setting	Frame integration mode (initial setting)		Field integration mode	
Scanning mode	Interlace	Non-interlace	Interlace	Non-interlace
Scanning	 FLD1 FLD2 ①③⑤ ②④⑥	 FLD1 FLD2 ①③⑤ ①③⑤	 FLD1 FLD2 ①2③4⑤6 ②3④5	 FLD1 FLD2 ①2③4 ①2③4
Storage time and VIDEO OUT correlation	 VD 1 2 1/60 sec VIDEO OUT 1 2	 VD 1 2 1/60 sec VIDEO OUT 1 2	 VD 1 2 1/60 sec VIDEO OUT 1 2	 VD 1 2 1/60 sec VIDEO OUT 1 2
Vertical effective lines (TV lines)	485	242	350	242
RESTART RESET	 H RST V RST VIDEO OUT	 H RST V RST VIDEO OUT	 H RST V RST VIDEO OUT	 H RST V RST VIDEO OUT
Features and application	As the highest possible resolution is obtained, it is adapted to the measurements of the frame memory.	Same system as XC-39. Operates per 1 vertical line. Note: The operation is field integration mode.	Due to the storage of 1/60 seconds, a picture with even less disturbances than the frame integration mode is obtained. Adapted to pick up a moving object.	This system obtains all the vertical information without decreasing the sensitivity in non-interlace mode.

[Fig. 2] Relation between scanning mode and integration mode


FRAME INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD
FIELD INTEGRATION MODE
INTERLACE
A=262
E.L.=485
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242.5H
V BLKG
20H
IMAGING B
242.5H
V BLKG
20H
IMAGING C
242.5H
STORAGE1
1 FIELD
STORAGE 2
1FIELD
NON-INTERLACE 1
A=262
E.L.=243
HD
R.R
OUT PUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
243H
STORAGE 1
1FIELD
NON-INTERLACE2
A=262
E.L.=242
HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
IMAGING A
242H
V BLKG
20H
IMAGING B
242.5H
STORAGE1
1FIELD

[Fig.3]



242
243
V BLKG
20H
IMAGING B
242.5H
STORAGE 1
2FIELD
STORAGE 2
2FIELD
IMAGING C
242.5H
IMAGING D
242.5H
244
245
246
247
248
484
485
486
1
2
3
4
240
241
482
483
V BLKG
20H
IMAGING B
242.5H
STORAGE 2
1FIELD
IMAGING C
242.5H
5
V BLKG
20H
IMAGING B
243H
239
V BLKG
20H
IMAGING B
242.5H

[Fig.3]

2-3-3. RESTART RESET Mode

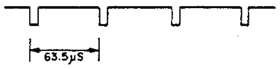
In the RESTART RESET (R.R) mode, information for one screen can be retrieved at any time. It is necessary to internally set the R.R mode in the camera to provide the R.R mode. See Section 2-4 "OPERATION MODE SETTING". Supply the HD and R.R signals to pin 6 and pin 7 of the 12-pin connector to obtain output.

• Input conditions for the HD and R.R signals

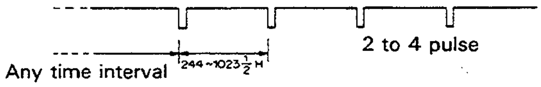
- Frequency (period)

HD signal: 15.734 KHz ± 1% (63.56 μs ± 1%)

Continuous pulse



R.R signal: 244 to 1023 1/2 H
2 to 4 pulses depending on the mode



- Phase

The same phase conditions as for the HD and VD mode are applied to this mode. See Section 2-3-2.

• Explanation of the timing chart

Figure 3 is the timing charts for each operation mode. The details of these timing charts are given below:

- Frame integration interlace mode

The R.R requires four pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 244 to 1023. It is 262 in the figure.
Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING C (ODD) and IMAGING D (EVEN). The CCD is reset in the intervals of IMAGING A and IMAGING B. Therefore, signals output during these intervals are meaningless.

- Field integration interlace mode

The R.R requires three pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 244 to 1023. It is 262 in the figure.
Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING B (ODD) and IMAGING C (EVEN). The CCD is reset in the interval of IMAGING A; therefore, signals output during this interval are irrelevant.

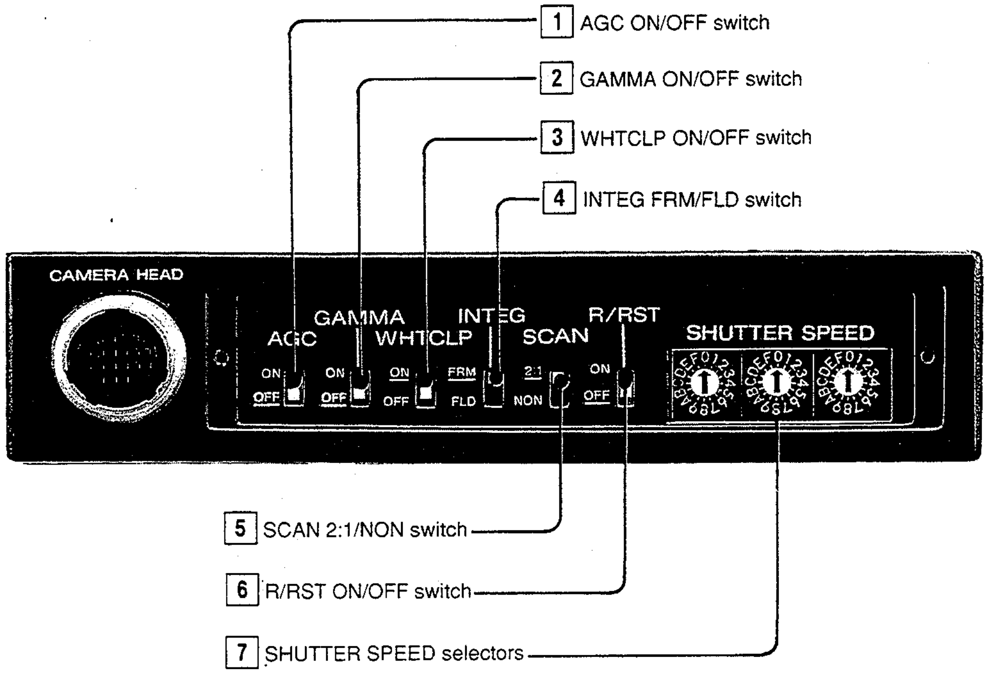
- Non-interlace mode

The R.R requires two pulses regardless of the storage mode. Set the period of the R.R to A H. A is an integer, 244 to 1023. It is 262 in the figure.
Shooting information in STORAGE 1 is output in the interval of IMAGING B. The CCD is reset in the interval of IMAGING A; therefore, signals output during this period are irrelevant.

2-4. MODE SETTING

The operation mode of XC-77RR can be switched according to its application. The mode is set with the switches for PR-133 board, TG-58 board, and DR-96 board on the front panel and inside the camera control unit.

2-4-1. Setting the Mode On the Front Panel


1 AGC ON/OFF switch
2 GAMMA ON/OFF switch
3 WHTCLP ON/OFF switch
4 INTEG FRM/FLD switch
CAMERA HEAD
AGC
GAMMA
WHTCLP
INTEG
SCAN
R/RST
SHUTTER SPEED
ON
OFF
FRM
FLD
2:1
NON
5 SCAN 2:1/NON switch
6 R/RST ON/OFF switch
7 SHUTTER SPEED selectors

1. AGC (Auto Gain Control) ON/OFF switch
This switch is used to set the gain of video output signal.
Set this switch to "ON" to activate AGC function.
Set this switch to "OFF" to fix the gain to 0 dB.
The switch is set to "OFF" at the factory.

2. GAMMA (Gamma Compensation) ON/OFF switch
This switch is used to set the gamma compensation of video output signals.
Set this switch to "ON" to output gamma compensated video signals.
Set this switch to "OFF" to output linear video signals without gamma compensation. This setting provides video signals proportional to the light from the object.
The switch is set to "OFF" at the factory.

3. WHTCLP (White Clip) ON/OFF switch
This switch is used to set the white clip level of video output signals.
Set this switch to "ON" to set the clip level to 110 IRE ± 10 IRE.
Set this switch to "OFF" to set the clip level to 140 IRE ± 10 IRE.
The switch is set to "ON" at the factory.

4. INTEG (Integration mode) FRM/FLD (Frame/Field) ON/OFF switch

This switch is used to set the cycle of reading the signal charge from the photosensor of CCD.
Set this switch to "FRM" for Frame Integration mode in which signal charge of every frame is read.
Set this switch to "FLD" for Field Integration mode in which signal charge of every field is read.
The switch is set to "FRM" at the factory.

NOTE In the Frame Integration mode, the sensitivity during non-interlace operation is one-half of that during interlace operation.

5. SCAN (Scanning mode) 2:1/NON (2:1 Interlace/Non-interlace) switch

This switch is used to set the scanning mode of video output signals.
Set this switch to "2:1" for the Interlace mode.
Set this switch to "NON" for the Non-interlace mode.
The switch is set to "2:1" at the factory.

NOTE This switch setting is effective when the unit is operating on internal synchronization signals. To operate the unit on external synchronization signals, set the switch to "2:1" regardless of the selection of Interlace or Non-interlace mode.

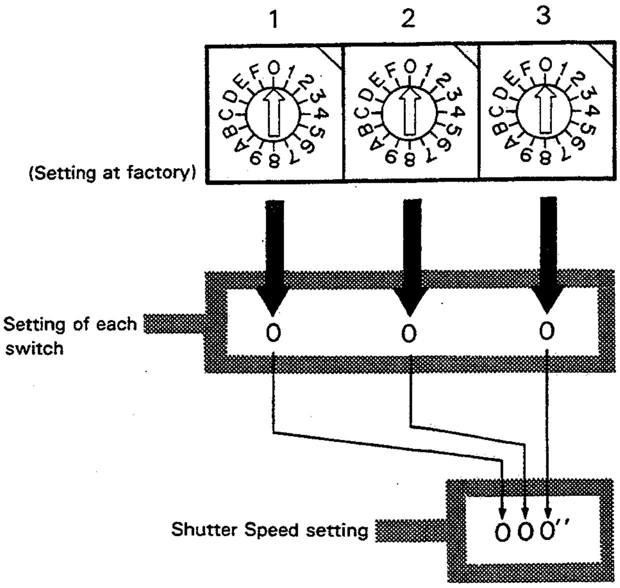
6. R/RST (Restart Reset) ON/OFF switch

This switch is used to set the external synchronization mode and ELECTRONIC SHUTTER mode.
Set this switch to "ON" when the ELECTRONIC SHUTTER function is off to select the Restart Reset mode. Set it to "ON" when the ELECTRONIC SHUTTER function is on to select the DONPISHA Shutter mode.
Set this switch to "OFF" to set the external synchronization mode to S/VS/VBS mode or HD, VD mode. Here, if the ELECTRONIC SHUTTER mode is on, the ELECTRONIC SHUTTER is set to the Normal Shutter mode.
The switch is set to "OFF" at the factory.

NOTE The ELECTRONIC SHUTTER function is turned on and off with the Shutter Speed switch. In the DONPISHA Shutter mode, external input reset pulse (trigger) is necessary (refer to "2-5. ELECTRONIC SHUTTER).
S/VS/VBS mode and HD, VD mode are switched automatically according to the input of synchronization signals. When synchronization signal is not input in these modes, the setting is automatically switched to the Internal Synchronization mode.
For details on the External Synchronization modes, refer to "2-3. EXTERNAL SYNCHRONIZATION."

7. SHUTTER SPEED switch

This switch is used to turn the ELECTRONIC SHUTTER function on and off and to set the shutter speed.
This Shutter Speed switch shows three hexadecimal digits.



Set the switch to "000" to turn off the ELECTRONIC SHUTTER function.
Set the switch to a combination other than "000" to turn on the ELECTRONIC SHUTTER function. The selected combination determines the shutter speed.
The switch is set to "000" at the factory.

NOTE Even with the same Shutter Speed setting, the shutter speed differs between DONPISHA Shutter mode and Normal Shutter mode.
For details on ELECTRONIC SHUTTER, refer to "2-5. ELECTRONIC SHUTTER."

2-4-2. Setting Modes In the Camera Control Unit

Six types of mode switches listed below can be found in the Camera Control unit.

1. Long Term Reset (L.T.R.) Shutter mode
2. Switch for terminating external synchronization signals with 75 ohms
3. Internal HD and VD Signal Output/External Synchronization Signal Input switch
4. Internal Clock Output/Internal VD Signal Output switch
5. Video Output Signal Sync ON/OFF switch
6. DONPISHA/L.T.R. Shutter External Synchronization mode

1. Long Term Reset Shutter mode

This mode is for setting the shutter speed externally. This mode is selected by setting SW6 on the DR-96 board to "ON". The mode is set to "OFF" at the factory.

NOTE To stabilize the video output signals, set the AGC ON/OFF switch on the front panel to "OFF", the INTEG FRM/FLD switch to "FLD", and the SCAN 2:1/NON switch to "2:1". For details on the shutter mode, refer to "2-5. ELECTRONIC SHUTTER."

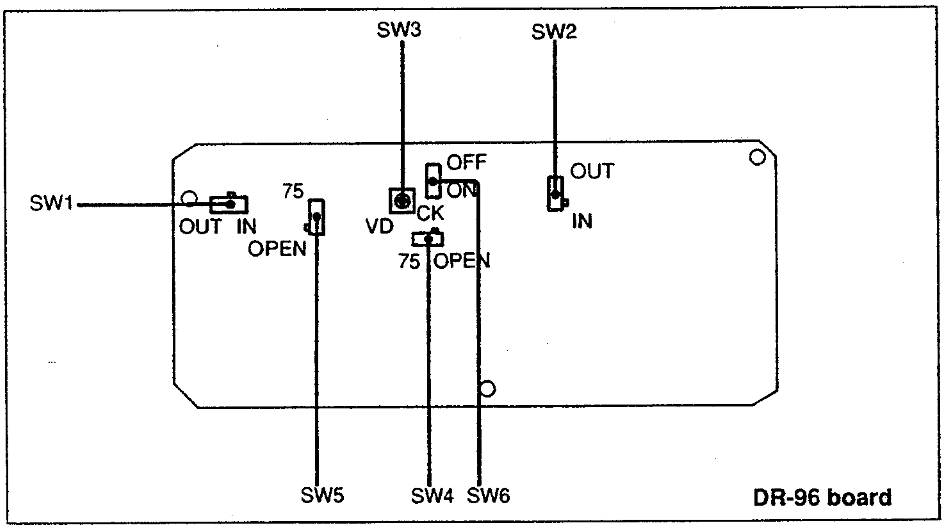
2. Switch for terminating external synchronization signals with 75 ohms

This switch is used to select whether or not to terminate external synchronization signals (S/VS/VBS signals and HD and VD signals) with 75 ohms. S/VS/VBS signal or VD signal input side is set with SW5 on the DR-96 board. HD signal input side is set with SW4 on the DR-96 board. With either switch, select "75" to terminate the signal with 75 ohms and "OPEN" to not terminate the signal with 75 ohms. Both switches are set to "OPEN" at the factory.

3. Internal HD and VD Signal Output/External Synchronization Signal Input switch

Reset this switch to output the synchronization signals (HD and VD) inside the camera module from the External Synchronization Signal Input Terminal. Set SW1 on the DR-96 board to "OUT" to output internal VD signal. Set SW2 on the DR-96 board to "OUT" to output internal HD signal. Set both switches to "IN" to input external synchronization signals. Both switches are set to "IN" at the factory.

NOTE Do not externally terminate the internal HD and VD signal outputs as they are TTL-level negative electrode pulses.



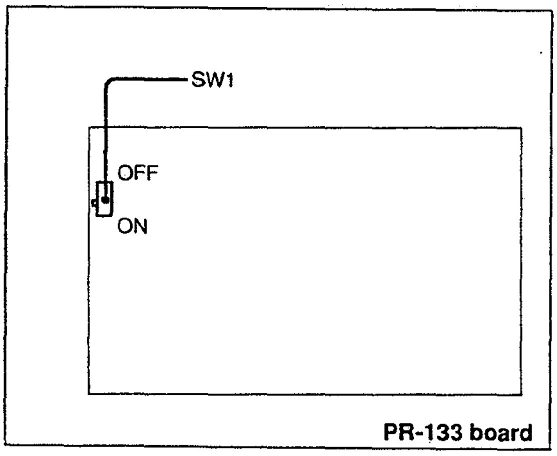
DR-96 board

4. Clock Output/Internal VD Signal Output switch
   This switch is used to select internal clock (14 MHz) or internal VD signal to be output from pin 9 of the 12-pin connector.
   Select the output with SW3 on the DR-96 board.
   Set the switch to "CK" to output internal clock.
   Set the switch to "VD" to output internal VD signal.
   The switch is set to "VD" at the factory.

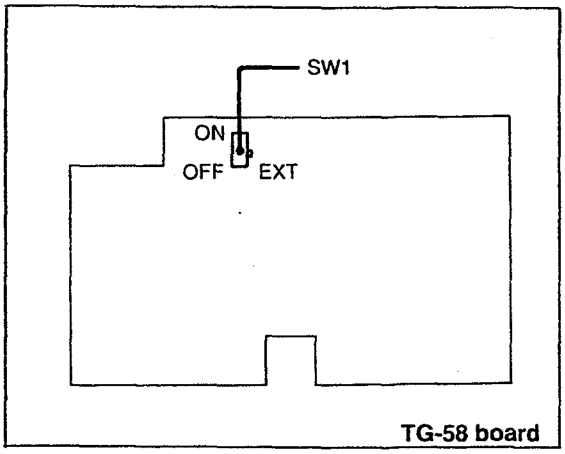
NOTE Do not externally terminate the internal VD signal output as it is TTL-level negative electrode pulse. The output of this clock is 0.5 Vp-p upon termination with 75 ohm output.

5. Video Output Signal Sync ON/OFF switch
   SW1 on PR-133 board is used to select whether or not to add a sync signal to the video output signal.
   Set the switch to "ON" to add sync signal.
   Set the switch to "OFF" to not add sync signal.
   The switch is set to "ON" at the factory.

6. DONPISHA/L.T.R. Shutter HD Synchronization mode
   This mode is used to apply external synchronization to DONPISHA Shutter and L.T.R. Shutter for H by inputting HD signal from pin 6 of the 12-pin connector.
   Set SW1 on TG-58 board to "ON" to select this mode.
   Set the switch to "OFF" to return to normal mode.
   The switch is set to "OFF" at the factory.



PR-133 board



TG-58 board

2-5. ELECTRONIC SHUTTER

XC-77RR has three primary Electronic Shutter modes:

1. Normal Shutter mode
2. DONPISHA Shutter mode
3. Long Term Reset Shutter mode

2-5-1. Normal Shutter Mode

The Normal Shutter refers to an ordinary electronic shutter. It is available in two modes: low speed and high speed. The speed mode is switched automatically when the Shutter Speed switch is set.

Shutter Speed Switch	Normal Shutter Mode	Shutter Speed
"001" to "0F2"	Low speed	1/63.275 sec. to 1/2053.080 sec.
"0F3" to "6DD"	High speed	1/2362.736 sec. to 1/357,945.498 sec.
"6DE" to "FFF"	Unselective	

NOTE In the Normal Shutter mode, normal signals will not be output if the Shutter Speed switch is set between "6DE" and "=FFF."
The Normal Shutter is designed for use in the Field Integration mode. If the Normal Shutter is used in Frame Integration mode, the storage time of the EVEN field will be longer than that of the ODD field by 72 clock's worth (≒ 5.04 μsec.). Consequently, this difference in storage time appears on the output screen as a flicker. In addition, the sensitivity will be half of that of the Field Integration mode.

a. Low speed mode
The shutter is set to the Low Speed mode when the Shutter Speed switch is set to "001" through "0F2." For every incremental change made to the position of this switch, the shutter pulse is changed by 1 H increment. This process is illustrated in Fig. 1.

When the switch is set to "001," for example, the shutter pulses between the SG pulse and "1" are output. The storage time in this case is after the "1" pulse to the following SG pulse. In addition, Fig. 1 illustrates the status when the Shutter Speed switch is set to "015".

Furthermore, the signals integrated in "STORAGE A" are output at "IMAGE A," and the signals integrated in "STORAGE B" are output at "IMAGE B."

The relational expression between the Shutter Speed switch setting and shutter speed in the Low Speed mode is:

Shutter speed (sec.)

$$= \frac{113{,}597 - 455\ [(1\text{'s Setting}) \times 16^2 + (2\text{'s setting}) \times 16 + (3\text{'s setting})]}{7{,}159{,}091}$$

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

$$\text{Ans} = \frac{113{,}597 - 7{,}159{,}091 \times 0.001}{455}$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.001 sec. (1/1000 sec.) is:

$$\text{Ans} = \frac{113{,}597 - 7{,}159{,}091 \times S}{455} = 233.9294 \fallingdotseq 234$$

Converting this 234 into a hexadecimal value, we arrive at "0EA."
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "0EA."

b. High speed mode

The shutter speed is set to High Speed mode when the Shutter Speed switch is set to "OF3" through "6DD." For each incremental change made to the position of the switch, the shutter pulse duration in V BLK is changed by 280 nsec increment. This process is illustrated in Fig. 2.
The storage period in this mode is from the last transition of "broad pulse" to SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in "STORAGE B" are output at "IMAGE B."

The relational expression between the Shutter Speed switch setting and shutter speed in the High Speed mode is:

Shutter speed (sec.)

$$= \frac{3516 - 2\,[(1\text{'s setting}) \times 16^2 + (2\text{'s setting}) \times 16 + (3\text{'s setting})]}{7{,}159{,}091}$$

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

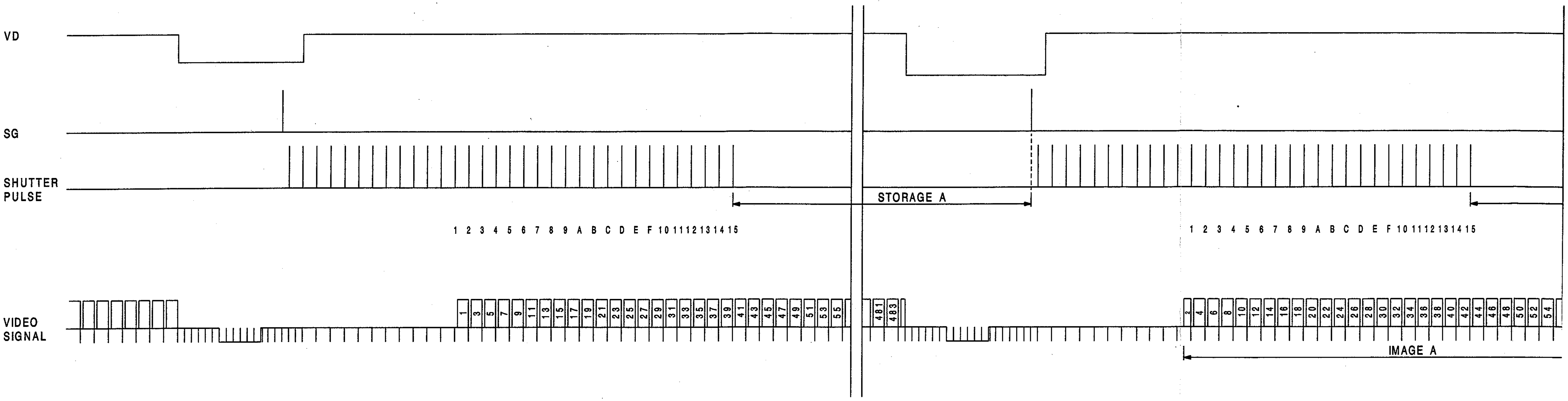
$$\text{Ans } 1758 - = \frac{7{,}159{,}091}{2 \times S}$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.0001 sec. (1/10,000 sec.) is:

$$\text{Ans} = 1758 - \frac{7{,}159{,}091}{2} \times 0.0001 = 1400.045 = 1400$$

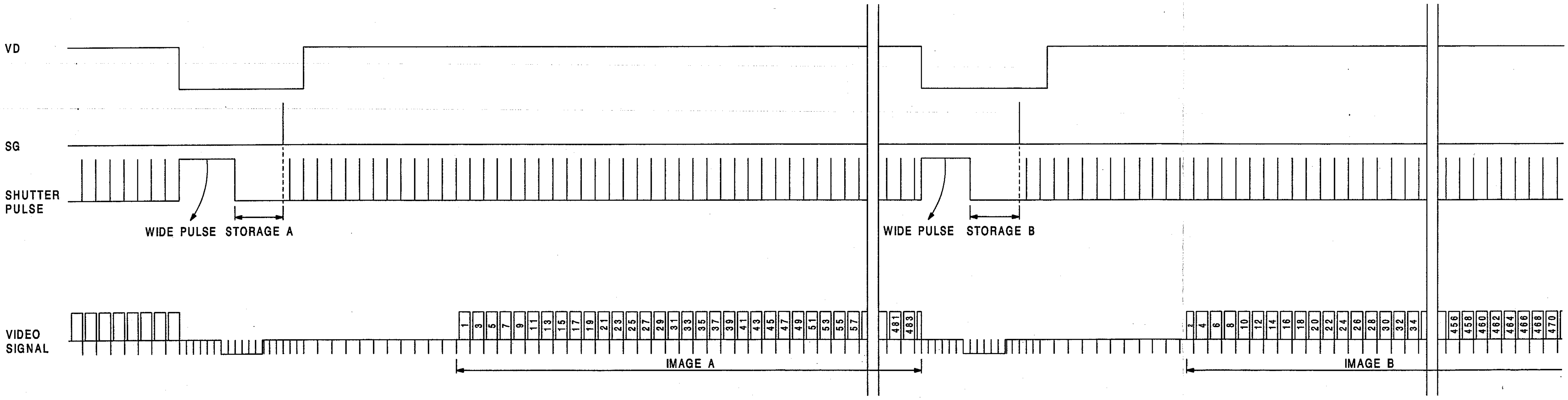
Converting this 1400 into a hexadecimal value, we arrive at "578".
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "578".


VD
SG
SHUTTER PULSE
STORAGE A
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55
481 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54
IMAGE A

Normal Shutter (EIA)

Low speed mode

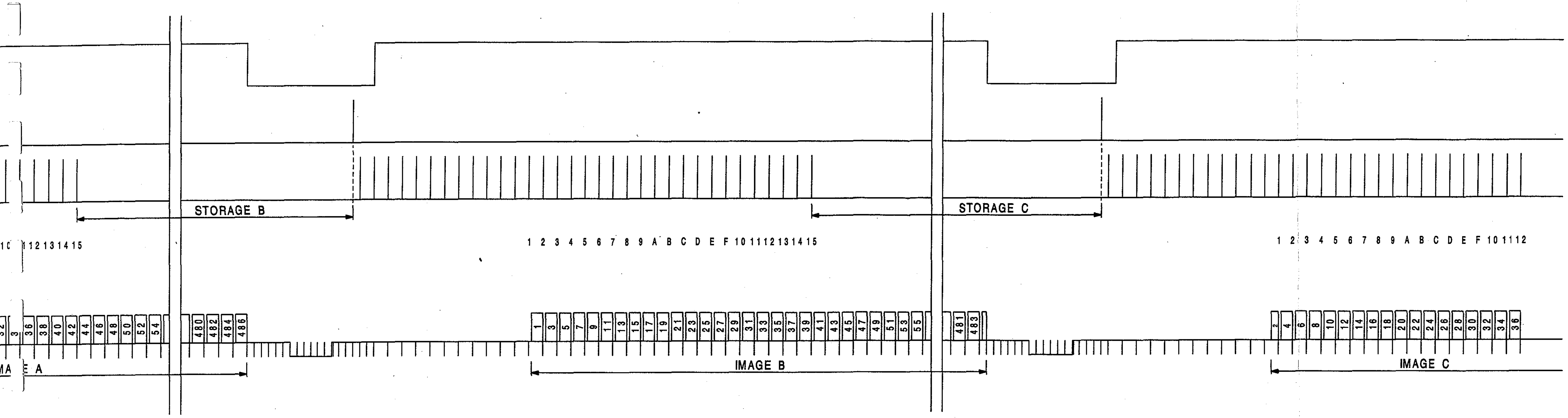
Fig.1


VD
SG
SHUTTER PULSE
WIDE PULSE
STORAGE A
WIDE PULSE
STORAGE B
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57
481 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
456 458 460 462 464 466 468 470
IMAGE A
IMAGE B

Normal Shutter (EIA

High speed mode

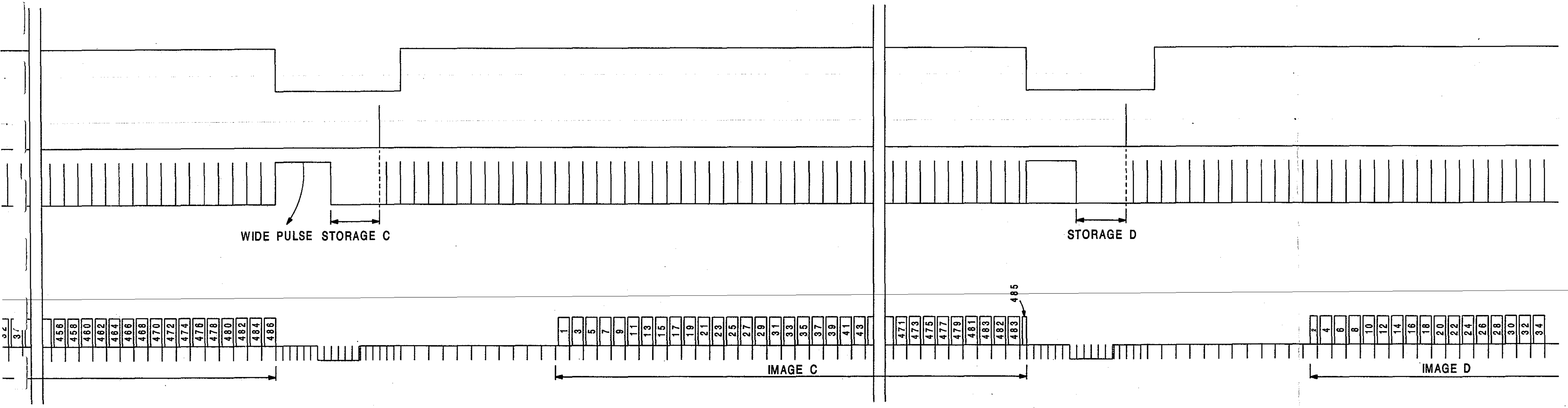
Fig.2


STORAGE B
STORAGE C
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12
36 38 40 42 44 46 48 50 52 54
480 482 484 486
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55
481 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
E A
IMAGE B
IMAGE C

Normal Shutter (EIA)

Low speed mode

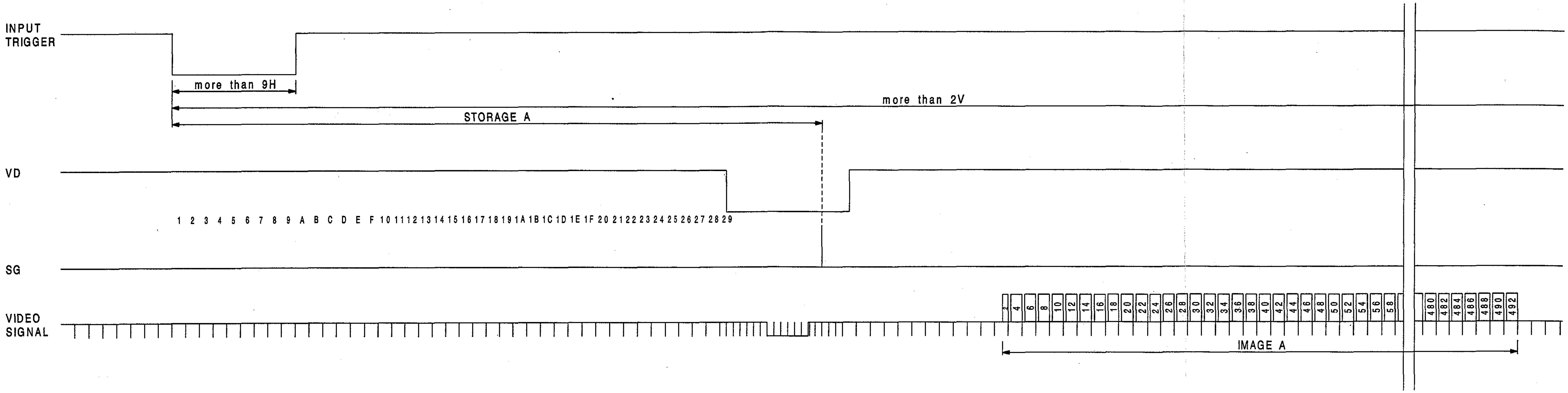
Fig.1


WIDE PULSE
STORAGE C
STORAGE D
485
456 458 460 462 464 466 468 470 472 474 476 478 480 482 484 486
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43
471 473 475 477 479 481 483 482 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
IMAGE C
IMAGE D

Normal Shutter (EIA)

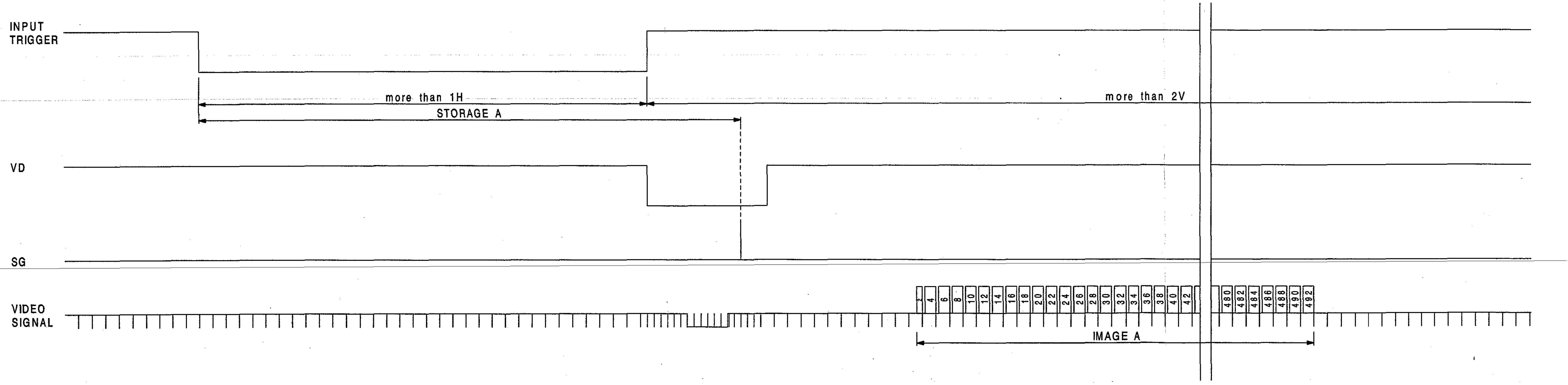
High speed mode

Fig.2


INPUT TRIGGER
more than 9H
more than 2V
STORAGE A
VD
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29
SG
VIDEO SIGNAL
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
480 482 484 486 488 490 492
IMAGE A

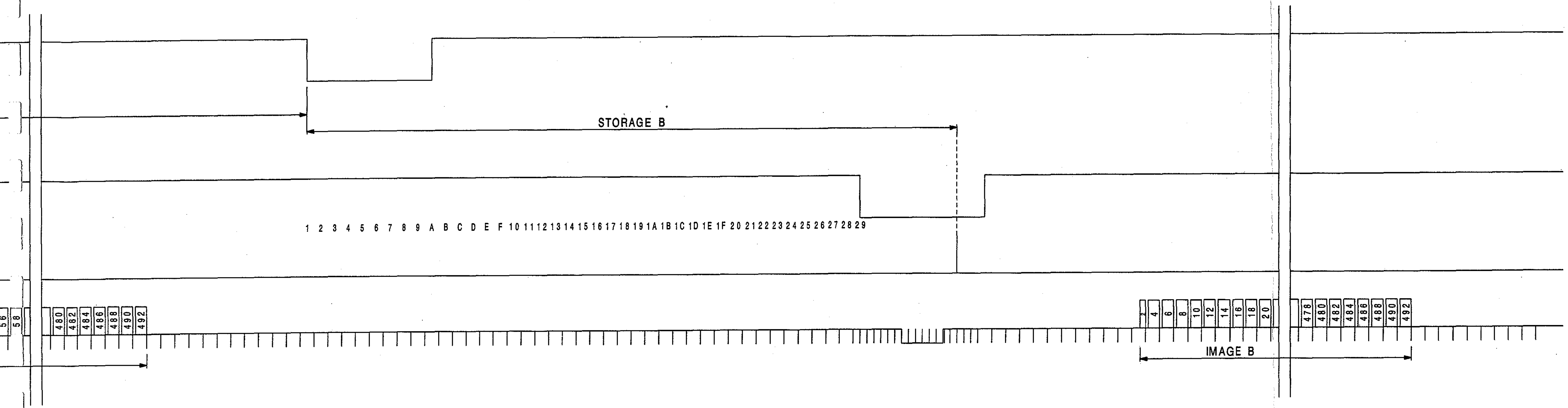
Donpisha Shutter mode (E

Fig.3


INPUT TRIGGER
more than 1H
more than 2V
STORAGE A
VD
SG
VIDEO SIGNAL
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42
480 482 484 486 488 490 492
IMAGE A

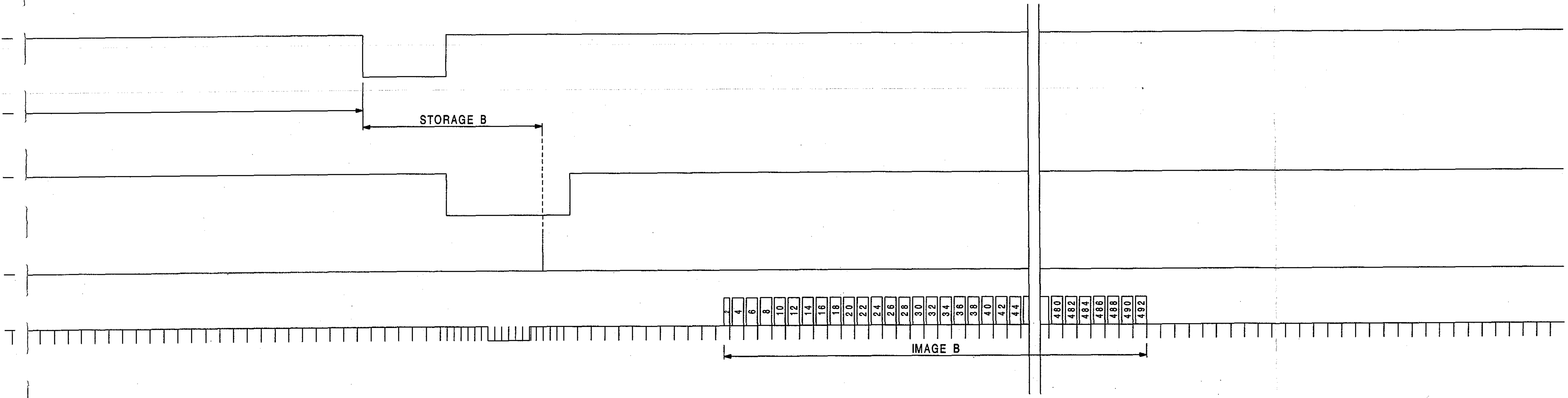
Long Term Shutter (EIA

Fig.4


STORAGE B
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29
56
58
480
482
484
486
488
490
492
2
4
6
8
10
12
14
16
18
20
478
480
482
484
486
488
490
492
IMAGE B

Donpisha Shutter mode (EIA)

Fig.3


STORAGE B
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
480
482
484
486
488
490
492
IMAGE B

Long Term Shutter (EIA)

Fig.4

2-5-2. DONPISHA Shutter Mode

In this shutter mode, the electronic shutter begins storage when an external trigger pulse is received. The trigger is input from pin 7 of the 12-pin connector.
Storage is begun approximately 1 sec after the last transition of the trigger input pulse and is performed until SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in "STORAGE B" are output at "IMAGE B."
For every incremental change made to the position of the Shutter Speed switch, the storage time is changed by 1 increment. This process is illustrated in Fig. 3.

When the switch is set to "001," for example, internal VD is output at the timing of "1" after the trigger is input. When the switch is set to "002," the VD is output at the timing of "2".
Fig. 3 illustrates the condition when the Shutter Speed switch is set to "029".
The recommended duration of trigger pulse to input is 9H through 20H. Furthermore, the required input gap is "2 fields" or more when the Shutter Speed switch is set to "001" through "100," and "shutter speed + 1 field" or more when it is set to "101" through "FFF".

The relational expression between the Shutter Speed switch and shutter speed in the DONPISHA mode is:

$$\text{Shutter speed (sec.)} = \frac{5609 + 910\ [(\text{1's setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{14{,}318{,}182}$$

From the equation above, the range of shutter speed is 1/2196.377 (sec.) to 1/3.837 (sec.).

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

$$\text{Ans} = \frac{14{,}318{,}182 \times S - 5609}{910}$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.002 sec. (1/500 sec.) is:

$$\text{Ans} = \frac{14{,}318{,}182 \times 0.002 - 5609}{910} = 25.30 \fallingdotseq 25$$

Converting this 25 into a hexadecimal value, we arrive at "019."
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "019."

NOTE In the DONPISHA Shutter mode, only one field even field is output for one trigger.
In addition, the DONPISHA Shutter is designed for use in the Field Integration mode. If the DONPISHA Shutter is used in the Frame Integration mode, the storage time of the EVEN field will be longer than that of the ODD field by 72 clock's worth (≒ 5.04 μsec.). The shutter speed set with the switch is reduced by the time length shown above. In addition, the sensitivity will be half of that of the Field Integration mode.

2-5-3. Long Term Reset Shutter

Unlike the other two shutter modes, the storage time can be set externally in this Electronic Shutter mode. The storage time is determined by the duration of Low level of the trigger pulse input from the outside. In essence, the storage time is lengthened in proportion to the increase in Low level duration. This concept is illustrated in Fig. 4.

The storage time in this mode is from the last transition of the trigger to the SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in STORAGE B" are output at "IMAGE B."

The storage time in the Long Term Reset Shutter mode can be expressed with the following equation:

$$\text{Storage time (sec.)} = \frac{6519}{14{,}318{,}182} + \text{(Pulse duration)}$$

NOTE Input the trigger in this mode at TTL level.

SECTION 3
THEORY OF OPERATION

3-1. OPERATION PRINCIPLE OF THE CCD

A CCD (Charge Coupled Device) consists of MOS (Metal-Oxide-Semiconductor) capacitors arranged in a regular array.
It basically performs three functions connected with handling charges.

1. Photoelectric conversion (photosensor)
Incident light generates charges on the MOS capacitors, with the quantity of charge being proportional to the brightness.

2. Accumulation of charges
When a voltage is applied to the electrodes of the MOS capacitors, an electric potential well is formed in the silicon layer. The charge is accumulated in this well.

3. Transmission of charge
When a high voltage is applied to the electrodes, a deeper well is formed; when a low voltage is applied, a shallower well is formed, In the CCD, this property is used to transmit the charge. When a high voltage is applied to the electrodes, a deep electric potential well is formed, and charge flows in from neighboring well. When this is repeated over and over among the regularly arranged electrodes, the charge is transferred from ones MOS capacitor to another. This is the principle of CCD charge transmission.

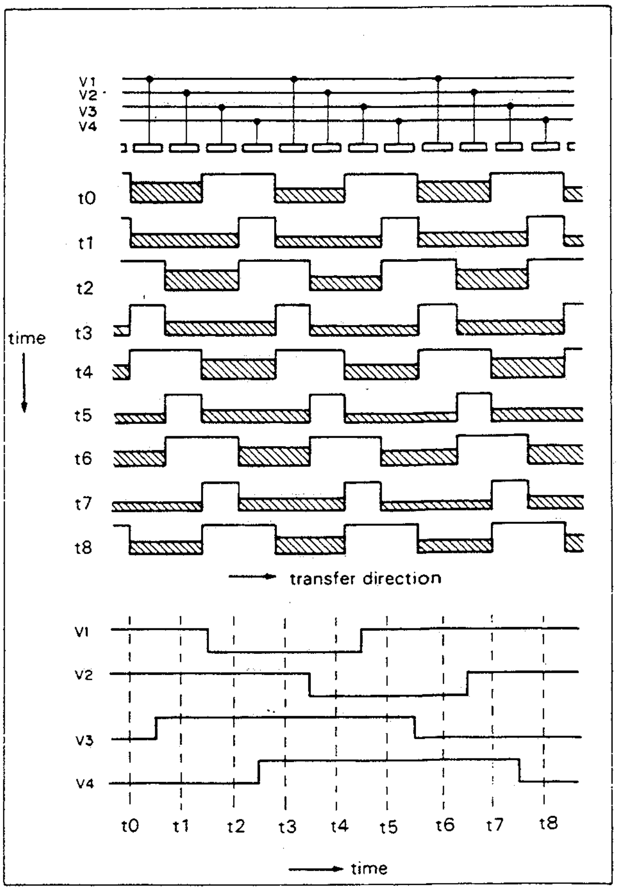
3-2. MECHANISM OF CCD CHARGE TRANSFER

The interline transfer system employed by the XC-77RR transfers the charges proportional to the brightness of the image produced on the CCD sequentially as shown in Figure 3 on page 3-2. The charge proportional to the brightness of the object is detected by the photo sensor, and transfered to the neighboring vertical shift register. Then this charge is transfered to the horizontal shift register in vertical sequence. Then it is output through the output section in horizontal sequence.

1. Vertical transfer
The vertical shift register transfers charges using a four-phase drive mode. Figure 1 shows an example of the changes which can occur in potential wells in successive time intervals.
At t0, the electrode voltages are (V1 = V2) > (V3 = V4), so the potential wells are deeper toward the electrode at the higher voltages V1 and V2. Charges accumulate in these deep wells.
At t1, the electrode voltages are (V1 = V2 = V3) > (V4), so the charges accumulate in the wells toward the electrode at V1, V2 and V3.
At t2, the electrode voltages are (V2 = V3) > (V4 = V1), so the charges accumulate in the wells toward the electrode at V2 and V3.
Electrode voltage states at t3 and after are shown below.

t3 (V2 = V3 = V4) > (V1)
t4 (V3 = V4) > (V1 = V2)
t5 (V4) > (V1 = V2 = V3)
t6 (V4 = V1) > (V2 = V3)
t7 (V4 = V1 = V2) > (V3)
t8 (V1 = V2) > (V3 = V4) (Initial state)

These operations are repeated to execute the vertical transfer.



[Fig.1] Vertical transfer

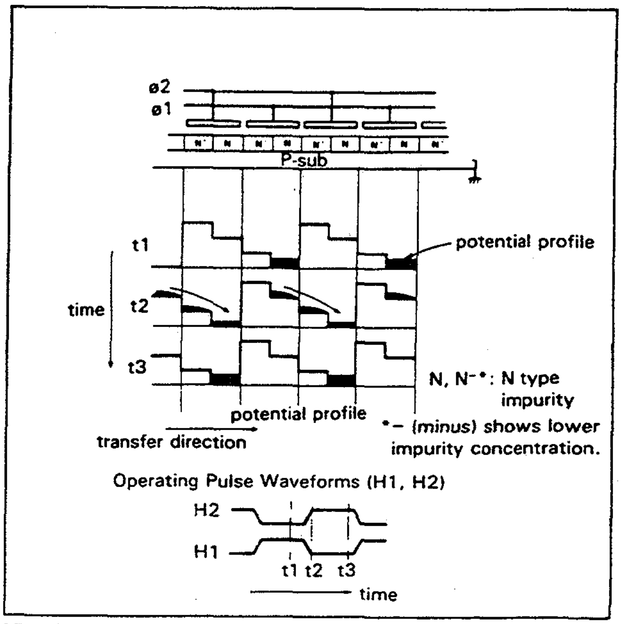
2. Horizontal transfer

The horizontal shift register transfers charges using a two-phase drive mode. Figure 2 shows an example of the changes which can occur in the potential wells in successive time intervals.

At t1, the electrode voltages are H1 > H2, so the potential wells are deeper toward the electrode of the higher voltage H1. The charges accumulate in these wells.

At t2, the electrode voltages H1 and H2 are inverted, the wells toward the electrode at voltage H2 becomes deeper while the wells toward the electrode at voltage H1 become shallower. So the wells at H2 are deeper than those at H1, the charge flows into the deeper wells toward the electrode at H2.

At t3, the electrode voltage have not changed since t2, so the charge flows into the wells at H2 and one transfer of charge is completed. These operations are repeated to execute the horizontal transfer.


ø2
ø1
N⁻
N
P-sub
t1
t2
t3
time
potential profile
potential profile
transfer direction
N, N⁻*: N type impurity
*– (minus) shows lower impurity concentration.
Operating Pulse Waveforms (H1, H2)
H2
H1
t1 t2 t3
time

[Fig.2] Horizontal transfer

3-3. PA-93 BOARD

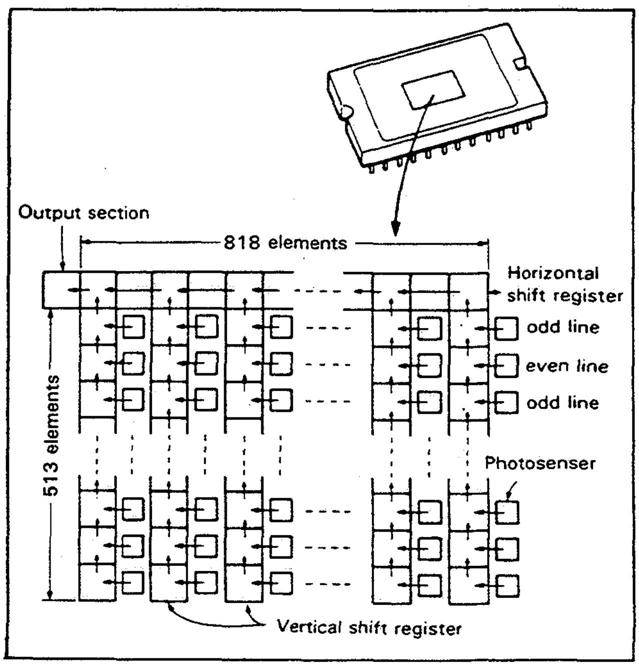
Light coming through the camera lens strikes the CCD chip surface of IC1 on the PA-93 board.

The surface of the CCD contains a number of photosensors. The array is 818 horizontal photosensors by 513 vertical photosensors, for a total of 419,634. Of these, the effective number is 768 horizontal photosensors by 493 vertical photosensors, or a total of 378,624. The incident light is converted by the photosensors into an electric charge proportional to the brightness of each color.

The converted electric charge is read from the photosensor by a register and is transferred in sequence and fed to the output section.

The register is subdivided into horizontal and vertical shift registers. As shown in Fig. 3, there are 818 vertical rows of registers, while there is only one horizontal row of registers in each, across the top. Each converted electric charge is transferred by field (frequency of VD) to the vertical shift register adjoining each photosensor. The electric charge is then vertically transferred in sequence at the vertical transfer clock V1, V2, V3, and V4 (frequency of HD; f_H) to the horizontal register. The horizontal registers transfer the charges horizontally at the horizontal transfer clock H1, H2 (910 f_H) to the output section.

The output from IC1 is output after the capacitor at the output section converts the electric charge into a voltage signal. The output is then sent to the CCU from the 75-ohm driver (Q10 to Q15) after passing it through the buffer (Q8, Q9). Q1 to Q3 are PG pulse drivers which reset the electric charge read by one picture element. Q4 to Q7 are shutter pulse drivers. The shutter pulse input is sent to the SUB input of IC1 by modulating the V SUB after driving.

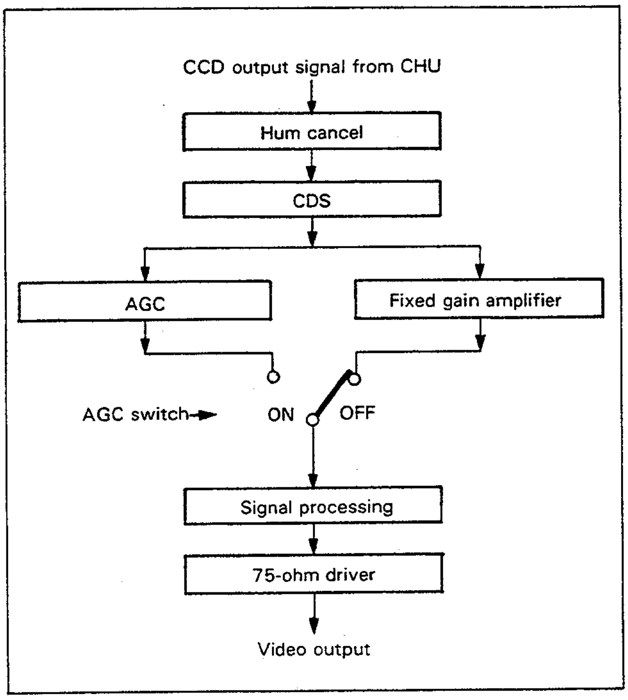

Output section
818 elements
Horizontal shift register
odd line
even line
odd line
513 elements
Photosenser
Vertical shift register

[Fig.3] The interline-transfer organization of the CCD image sensors

3-4. PR-133 BOARD

The PR-133 board converts the CCD output signal from the CHU into an image signal which the board processes and then outputs as a video signal.
This board mainly contains the following six blocks.

1. Hum cancel
2. CDS
3. AGC
4. Fixed gain amplifier
5. Signal processing
6. 75-ohm driver



[Fig. 4] PR-133 board concept

1. Hum cancel
This is a differential amplifier circuit which consists of Q1, Q2, and Q3.
The CCD output signal from the PA-93 board of CHU picks up hum elements while passing through the cable to the CCU. The hum cancel circuit eliminates these hum elements.
The gain of this hum cancel circuit is times 1.

2. Co-delayed double sampling (CDS)
The sample and hold circuit of the CDS eliminates a noise element peculiar to the CCD output signal. After the hum elements are eliminated by the hum cancel circuit, the CDS process divides the signal into two signals, and performs sample and hold for each signal. For one of these signals, sample and hold is performed twice, which includes sample and hold for the SHP pulse (Q4 to Q6) and the SHD pulse (Q7 to Q9). For the other signal, sample and hold is performed for only the SHP pulse (Q10 to Q12). The difference obtained between the two signals passed through sample and hold in these two routes is used as the image signal. This image signal is retrieved by differential amplifiers (Q13 to Q15).

3. Automatic gain control (AGC)
AGC is performed in IC1. The function of the AGC circuit stabilizes the output regardless of the IC operations. The gain is determined by the DC value at the gain control input (pin 6) of IC1. This DC value is produced from the image signal in detection circuits (Q23 to Q26).
The maximum gain is set by RV2, and the minimum gain is set by RV18.

4. Fixed gain amplifier
Fixed gain amplifier is a differential amplifier which consists of Q16, Q17, and Q18.
Fine adjustment of the gain is performed at RV1.

5. Signal processing
Either the AGC output or the fixed gain amplifier output is sent to the filter (FL1) after analog switching (Q19 to Q22, Q43). This switching is determined according to the setting of the switch on the front panel.
The signal that passes through the filter is sent to IC2. It is then output to the 75-ohm driver after signal processing such as clamping, gamma correction, blanking, setup addition, SYNC signal mixing, and white clipping have been performed.
The functions of the adjustment resistances in the signal processing block are explained below.

RV4 : Setup adjustment (gamma correction OFF)
RV5 : SYNC level adjustment (gamma correction OFF)
RV7 : Gamma correction adjustment (gamma correction ON)
RV8 : White clipping adjustment (without gamma correction, white clip ON)
RV9 : White clipping adjustment (gamma correction, white clip OFF)
RV11: White clipping adjustment (gamma correction ON, white clip OFF)
RV12: White clipping adjustment (gamma correction ON, white clip ON)
RV16: Setup adjustment (gamma correction ON)
RV17: SYNC level adjustment (gamma correction ON)

6. 75-ohm driver
The image signal processed in IC2 is output from CN5 as video signal via 75-ohm driver (Q27 to Q33).

3-5. TG-58 BOARD

The TG-58 board contains a synchronization signal generator circuit, a clock oscillation circuit for driving the CCD, and a shutter pulse generator circuit.
When there is an external synchronization signal, the VCO starts operating and outputs a clock which is synchronized with the external synchronization signal. When TP5 is +2.8V, the VCO outputs a clock of 28.6363MHz (1820 f_H). Fine adjustment is performed by CV1.
When there is an internal synchronization signal, a clock of the frequency indicated above is output using the quartz oscillator.

CLOCK: 910 f_H clock.
HD, VD: Horizontal and vertical synchronization signals.
XH1, XH2: 2-phase clock for driving horizontal shift register and transferring electric charge.
XV1 to XV4: 4-phase clock for driving vertical shift register and transferring electric charge.
XPG: Precharge gate control pulse.
Precharge gate is a gate for the horizontal shift register and output section. By controlling this gate, the transferred electric charge is converted into an electrical signal (voltage).
The above are output to the DR-96 board.

BLKG: Blanking signal.
SYNC: Composite SYNC signal.
CLP1: Clamping pulse for the optical black level of CCD output signal.
The above are output to the PR-133 board.

X SHUTTER: Shutter pulse signal.
The X SHUTTER is output to the PA-93 board via the SW-367 board.

3-6. DR-96 BOARD

The DR-96 board mainly contains the following five blocks.

1. External synchronization signal waveform shaping block
2. DC-DC converter and +9.5V power supply block
3. CCD drive clock driver
4. CCD substrate power supply block
5. 14MHz clock output driver

1. External synchronization signal waveform shaping block
This block consists of Q3 to Q5, IC6, and IC7.
When the VS signal or VBS signal is input as the external synchronization signal, the SYNC component in the signal is separated and output after the SYNC signal is waveshaped into a SYNC pulse of 5Vp-p. With HD or VD signals, it is output as a pulse of 5Vp-p regardless of the input level.

2. DC-DC converter and +9.5V power supply block
This block consists of PU1, IC1, and Q1.
The DC-DC converter (PU1) performs respective voltage outputs after converting the current from the external power supply (+12V) into voltages of +25V, +15V, +7V, +5V, and −7V. In addition to these voltages, the regulator circuit consisting of IC1 and Q1 generates +9.5V from the +12V.

3. CCD drive clock driver
This circuit drives each CCD drive clock (XH1, XH2, XV1 to XV4, XPG) sent from the TG-58 board and outputs them to the PA-93 board of the CHU via the SW-367 board.
XH1 and XH2 are inverted at the H clock driver (XH1: IC3, XH2: IC2) and output as H1 and H2.
XV1 to XV4 are inverted at the V clock driver (IC5) and output as V1 to V4.
XPG is output from the cable driver (IC4, Q6 to Q9) without being inverted. (The PG driver on the PA-93 board of CHU is used as the cable driver.)

4. CCD substrate power supply block

The power supply (V SUB) for the CCD substrates are of specific values (+9V to +19V) for each CCD. This value must be set in accordance with the value indicated on the top surface of DC-DC converter. Moreover, when a CCD is replaced, adjust the value in accordance with the new value (the new value is indicated in symbols on the rear of the CCD. See SECTION 4 for instructions on how to read the symbols.)

The block consists of Q15 and Q16, and the value of TP3 will be the voltage setting. Use RV2 for adjustments.

5. 14MHz clock output driver

This driver outputs a clock of 910 f_H, to the outside from the camera module. The driver consists of IC4 and Q10 to Q12. It can output a clock above 500mVp-p at 75-ohm termination.

3-7. SW-367 BOARD

The SW-367 board contains the following seven switches and 20-pin connector which connects the CHU and each signal.

SW1:	AGC switch
SW2:	Gamma correction switch
SW3:	White clipping switch
SW4:	Integration mode switch
SW5:	Scanning mode switch
SW7:	Restart reset switch
SW8 to SW10:	Shutter speed setting switch

Each CCD driving pulse and shutter pulse, and each power supply is output to the CHU.

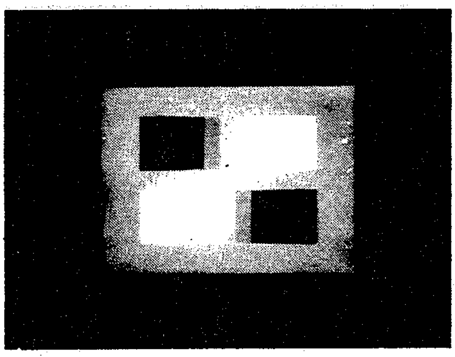
CCD output signal is input from the CHU.

SECTION 4
ALIGNMENT

4-1. FIXTURES AND EQUIPMENTS

- Oscilloscope
- Waveform monitor
- B/W monitor
- Digital voltmeter
- Power supply equipment: Junction box JB-77 (sold on the market) and regulated power supply unit, or camera adaptor DC-77RR (sold on the market)
- Camera cable: CCXC-12P02/05/10/20 (sold on the market)
- Extension cable: CCXC-20P25 (sold on the market)
- Tripod attachment: VCT-77RR (sold on the market)
- Lens: Standard VCL-16Y-M (sold on the market)
- Pattern box: PTB-500
  (SONY part No.: J-6029-140-A)

- Grayscale chart
  (SONY part No.: J-6026-130-B)

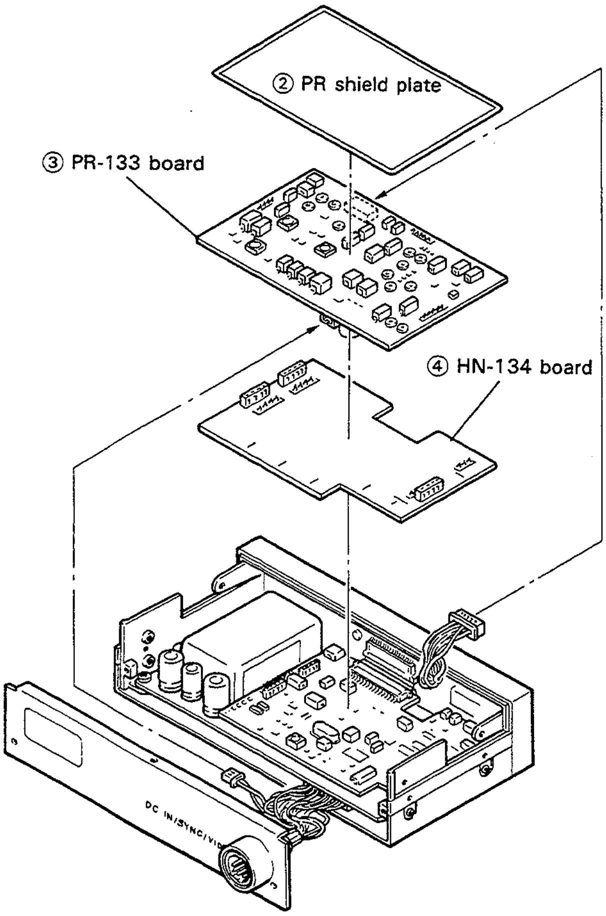


[If the pattern box is unavaliable]
- 100-W bulb
- Variable voltage transformer

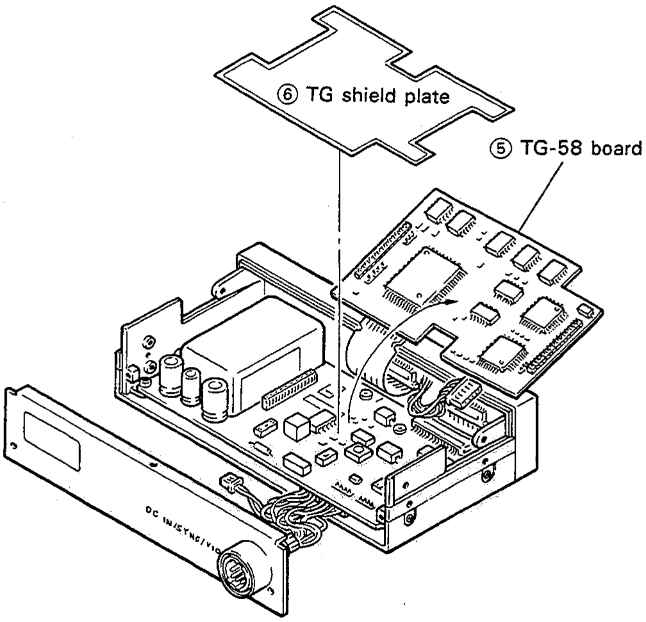
4-2. ADJUSTMENT OF DR-96 BOARD

4-2-1. Preparation

① Remove the upper case and rear panel by referring to "How to open the panel" section on page 1-19 (E).
② Remove the shield plate PR.
③ Remove the PR-133 board then remove the CN4 and CN5.
④ Remove the HN-134 board.


② PR shield plate
③ PR-133 board
④ HN-134 board
DC IN/SYNC/VI

⑤ Remove the TG-58 board as shown in the illustration.
⑥ Remove the shield plate TG.


⑥ TG shield plate
⑤ TG-58 board
DC IN/SYNC/VI

⑦ Connect the connectors (DC IN/SYNC/VIDEO) to the camera adoptor DC-77RR or the junction box JB-77 using the camera cable, and supply the power (refer to the Connections 4-3-2).

NOTE
Do not connect the camera head unit.

4-2-2. +9.5V Voltage Adjustment

Equipment: Digital voltmeter
Test point: TP2 (GND: TP1)
Adj. point: ⊘RV1
Spec.: +9.5V ± 0.2V

4-2-3. CCD Substratum Voltage Adjustment

Equipment: Digital voltmeter
Test point: TP3 (GND: TP1)
Adj. point: ⊘RV2
Spec.: Establishment value

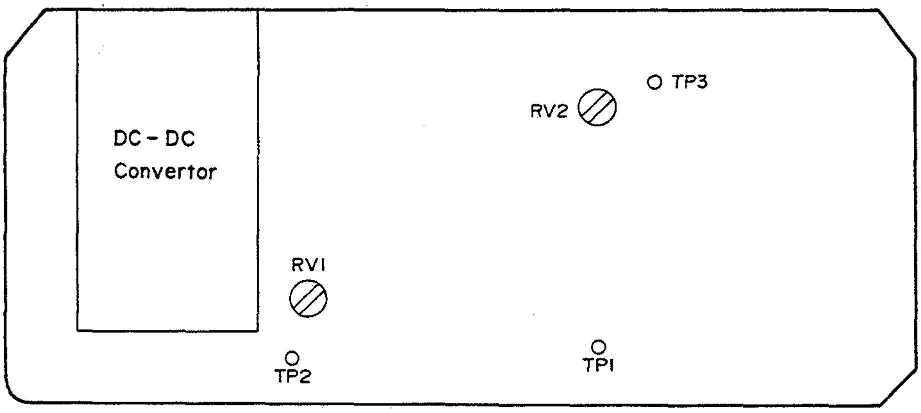
- *Establishment value*
  When the CCD image device is not replaced, the value is indicated on side of DC-DC converter.
  If the CCD is replaced, a substratum voltage setting volue is indicated in a 2-digit code on the rear of the new CCD.

2 digit-code display: □ □ ← Decimal
↑ Integral

The code integrals and the real value correspond with each other as follows:

Code integral	9	A	B	C	D	E	F	G	H	I	J
Value	9	10	11	12	13	14	15	16	17	18	19

<Example> F5 → 15.5 (V)



DR-96 board

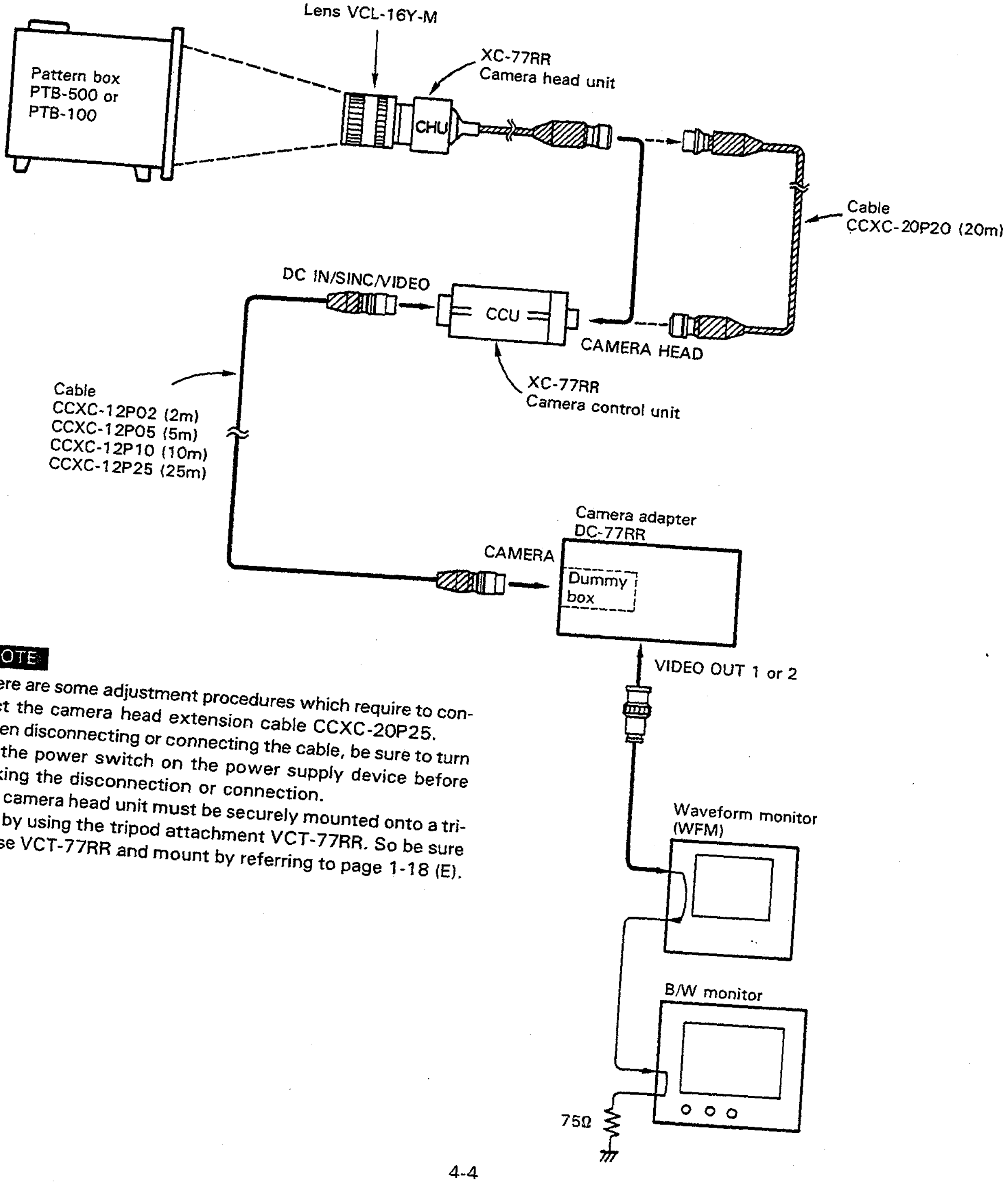
4-3. ADJUSTMENT OF PR-133 BOARD

4-3-1. Preparation

① Remove the upper case and rear panel by referring to "How to open the panel" section on page 1-19 (E).
② Remove the shield plate PR.

4-3-2. Connections

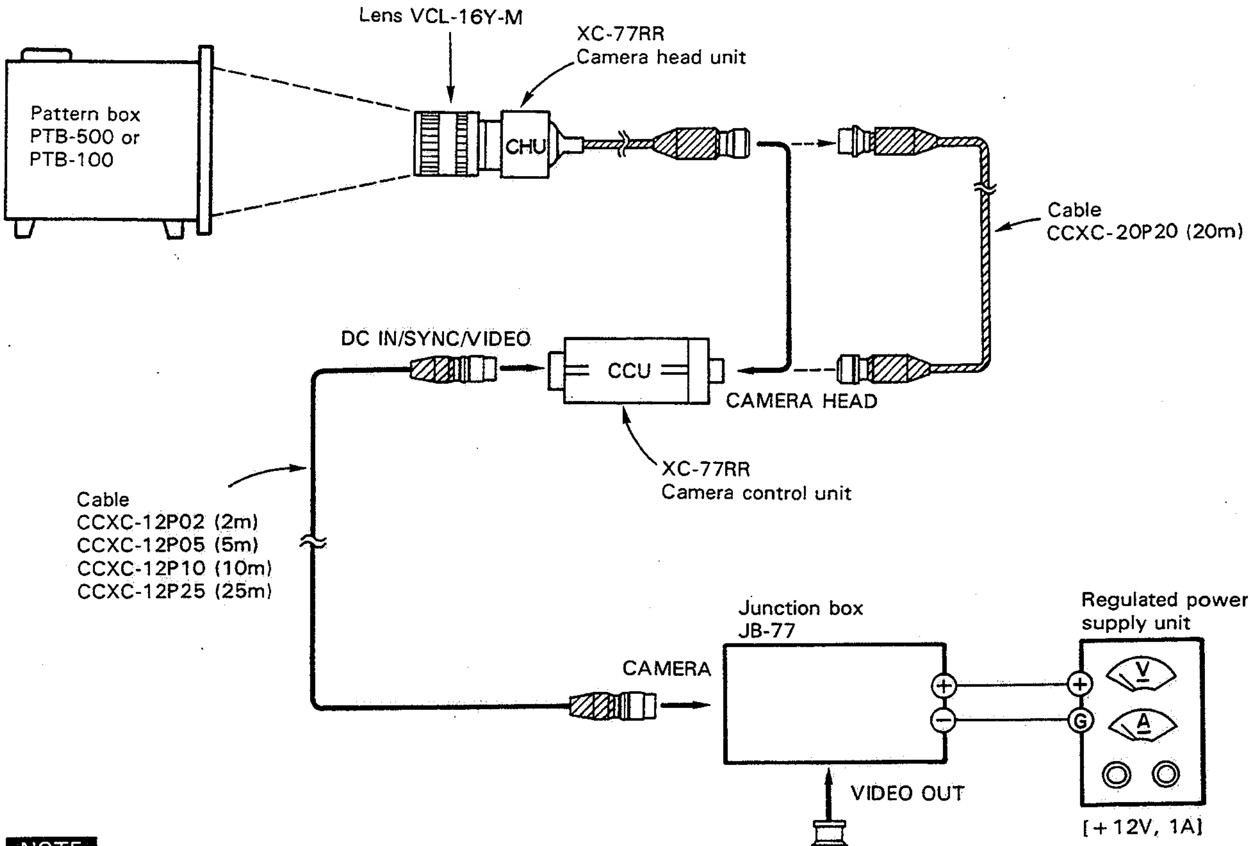
[Connection method 1]

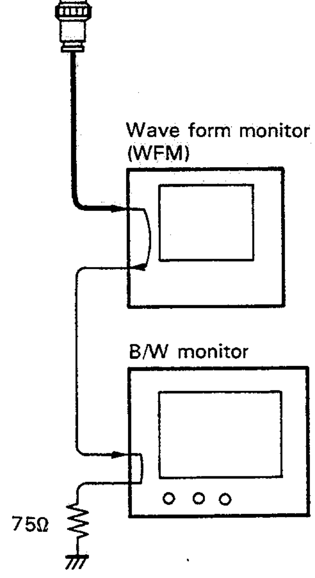

Lens VCL-16Y-M
XC-77RR
Camera head unit
Pattern box
PTB-500 or
PTB-100
CHU
Cable
CCXC-20P20 (20m)
DC IN/SINC/VIDEO
CCU
CAMERA HEAD
XC-77RR
Camera control unit
Cable
CCXC-12P02 (2m)
CCXC-12P05 (5m)
CCXC-12P10 (10m)
CCXC-12P25 (25m)
Camera adapter
DC-77RR
CAMERA
Dummy box
VIDEO OUT 1 or 2
Waveform monitor
(WFM)
B/W monitor
75Ω

NOTE

There are some adjustment procedures which require to connect the camera head extension cable CCXC-20P25.
When disconnecting or connecting the cable, be sure to turn off the power switch on the power supply device before making the disconnection or connection.
The camera head unit must be securely mounted onto a tripod by using the tripod attachment VCT-77RR. So be sure to use VCT-77RR and mount by referring to page 1-18 (E).

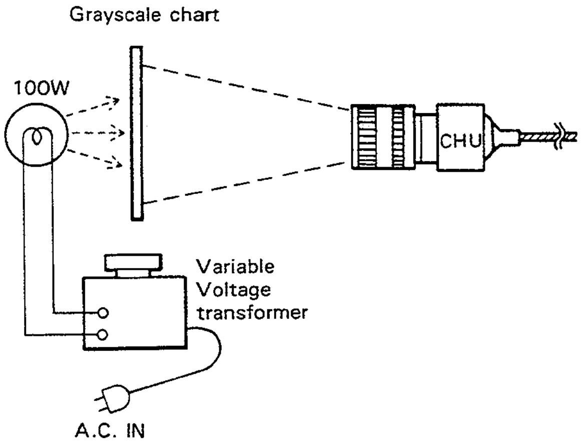
[Connection method 2]


Lens VCL-16Y-M
XC-77RR
Camera head unit
Pattern box
PTB-500 or
PTB-100
CHU
Cable
CCXC-20P20 (20m)
DC IN/SYNC/VIDEO
CCU
CAMERA HEAD
XC-77RR
Camera control unit
Cable
CCXC-12P02 (2m)
CCXC-12P05 (5m)
CCXC-12P10 (10m)
CCXC-12P25 (25m)
Junction box
JB-77
CAMERA
Regulated power
supply unit
V
A
G
VIDEO OUT
[+12V, 1A]


Wave form monitor
(WFM)
B/W monitor
75Ω

NOTE

There are some adjustment procedures which require to connect the camera head extension cable CCXC-20P25.
When disconnecting or connecting the cable, be sure to turn off the power switch on the power supply device before making the disconnection or connection.
The camera head unit must be securely mounted onto a tripod by using the tripod attachment VCT-77RR. So be sure to use VCT-77RR and mount by referring to page 1-18 (E).
If the pattern box is unavailable, make adjustment with a simple illuminator as shown below.


Grayscale chart
100W
CHU
Variable
Voltage
transformer
A.C. IN

4-3-3. SHP and SHD Adjustments

Preparation of SHP adjustment

- Subject: Grayscale chart
- Connect the camera head unit and camera control unit using the extension cable. (Before connecting the extension cable, be sure to turn the power off.)
- ⊘RV6: Mechanical center
- ⊘RV13: Clockwise full
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	OFF	FLD	2 : 1	OFF

Iris adjustment

Equipment: Waveform monitor

Adj. point: Lens iris

Spec.: A≒60 IRE

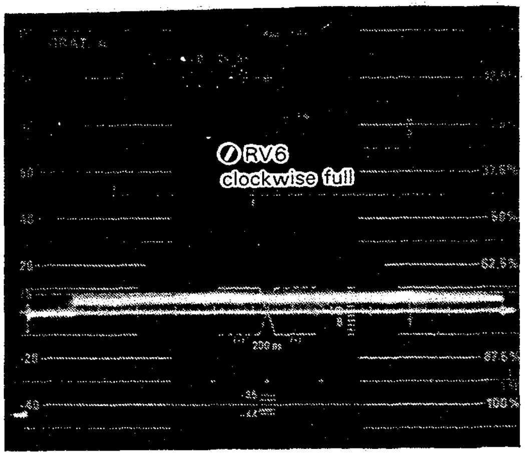
SHP adjustment

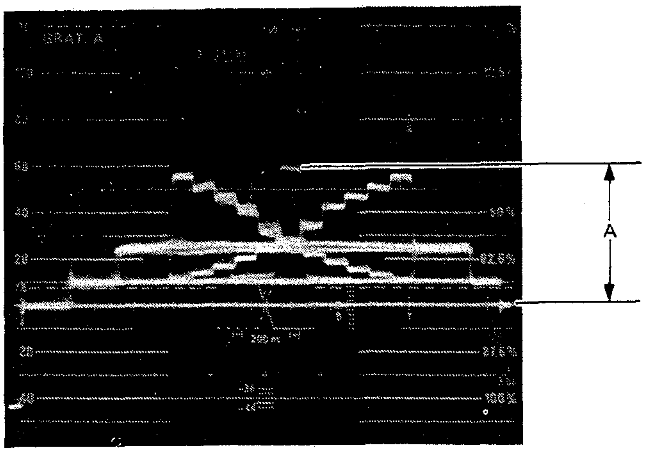
⊘RV6: Clockwise full

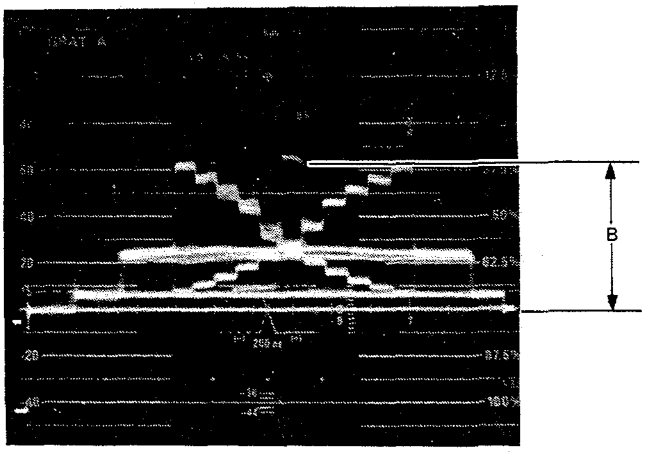
Equipment: Waveform monitor

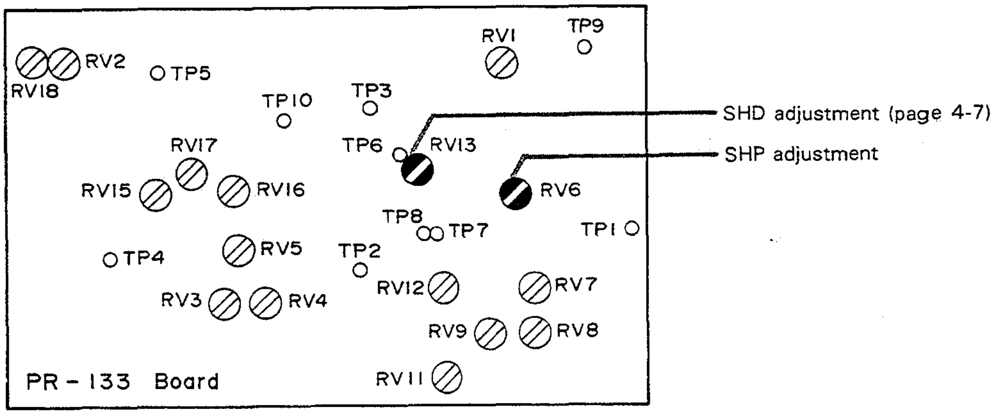
Adj. point: Routate ⊘RV6 counterclockwise slowly.

Spec.: Maximum B (Set at the second peak by rotating ⊘RV6 from the right side to the left side.)


⊘RV6 clockwise full






RV1
TP9
RV2
RV18
TP5
TP10
TP3
TP6
RV13
RV17
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
PR - 133 Board
RV11
SHD adjustment (page 4-7)
SHP adjustment

(Front panel side)

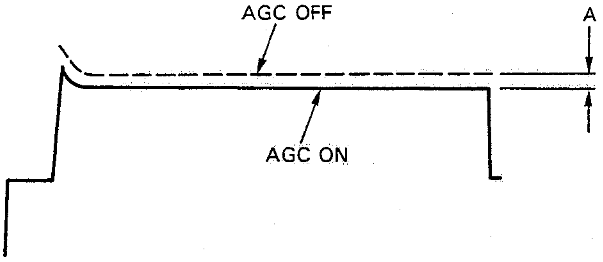
Preparation of SHD adjustment

- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	NON	OFF

SHD tentative adjustment

Equipment: Waveform monitor
Adj. point: ⊘RV13
Spec.: When the AGC ON/OFF switch is shifted from "OFF" to "ON", the level decreases 2^{+0}_{-1} IRE (=A).



Confirmation

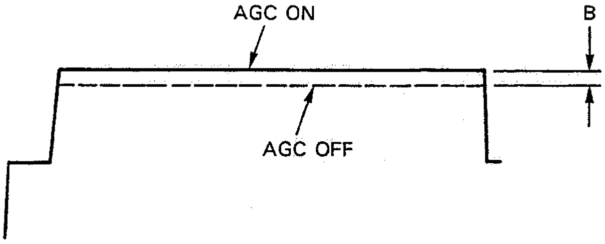
1. Ensure the AGC ON/OFF switch is set to "ON".
2. Ensure that FPN (Field Pattern Noise) is not shown on the black-and-white monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustments."
3. Set the lens iris at F5.6 then confirm that the picture quality on the black-and-white monitor is normal. If it is not normal, redo the procedures from "Preparation of SHP adjustment."
4. Ensure that when the SCAN 2:1/NON switch is switched to "2:1" the picture quality on the B/W monitor is normal. If it is not normal, redo the procedures from "Preparation of SHP adjustment."

SHD adjustment

- Disconnect the extension cable then connect the cable of the camera head unit to the camera control unit. (Before starting this procedure, turn the power off.)
- Set switches on inside cover panel of the camera control unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	2 : 1	OFF

Equipment: Waveform monitor
Adj. point: ⊘RV13
Spec.: When the AGC ON/OFF switch is shifted from "OFF" to "ON", the level increases 2^{+0}_{-1} IRE (=B)



Confirmation

1. Make sure that the AGC ON/OFF switch is set to "ON".
2. Ensure that FPN is not shown on the B/W monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustment."
3. Ensure that when the SCAN 2:1/NON switch is switched to "NON", FPN is not shown on the B/W monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustment."
4. Set the lens iris at F5.6, and confirm that the picture quality on the B/W monitor is normal. If not normal, redo the procedures from "Preparation of SHP adjustment."

4-3-4. Set-up Adjustment

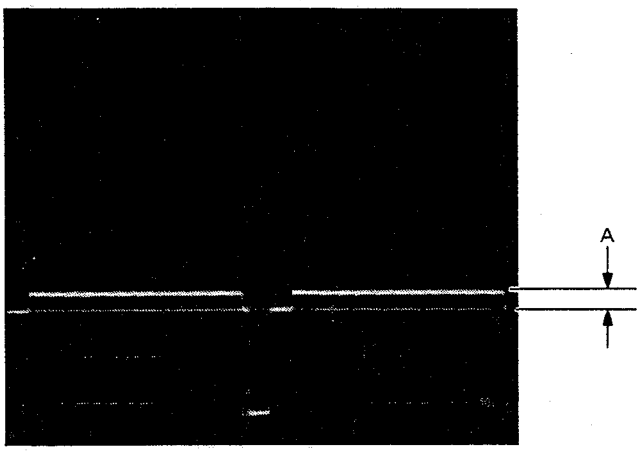
Preparation

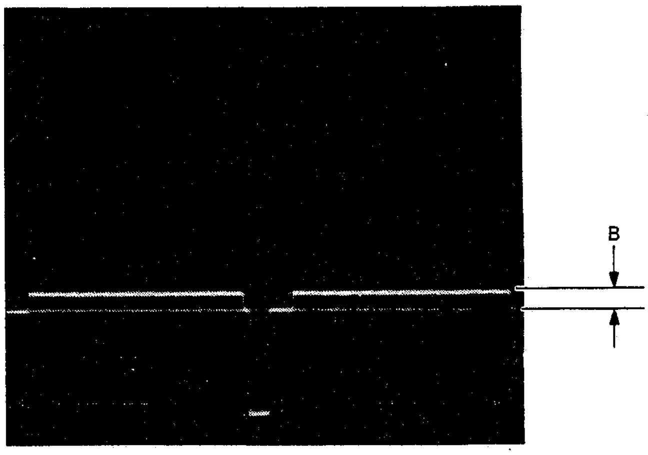
- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

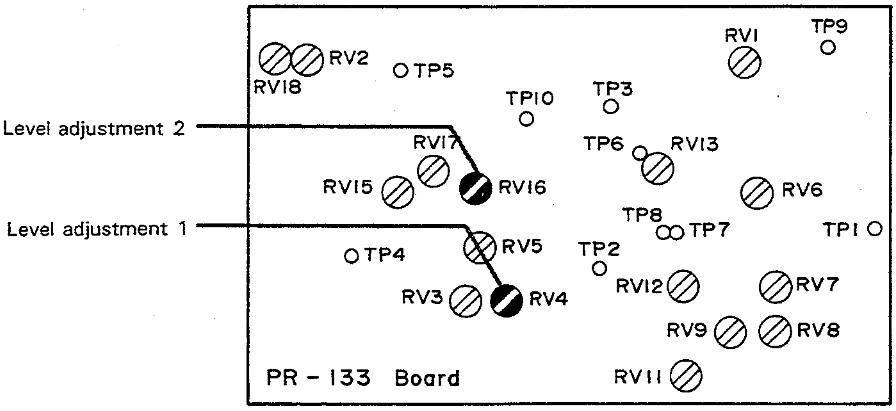
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

Level adjustment 1 (γ OFF)
Equipment: Waveform monitor
Adj. point: ⊘RV4
Spec.: A = 7.5 ± 0.5 IRE

Level adjustment 2 (γ ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV16
Spec.: B = 7.5 ± 0.5 IRE






Level adjustment 2
Level adjustment 1
RV18
RV2
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR - 133 Board

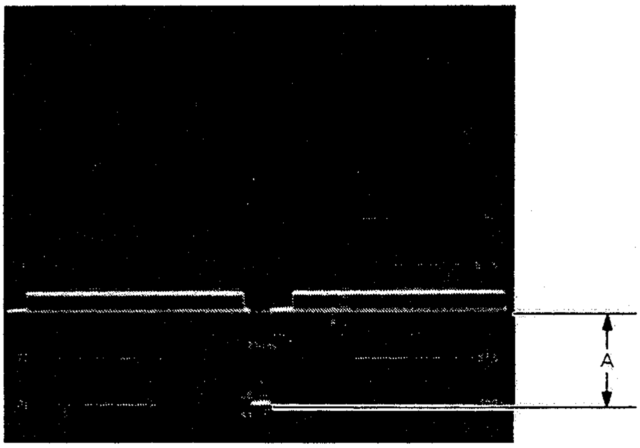
(Front panel side)

4-3-5. SYNC Adjustment

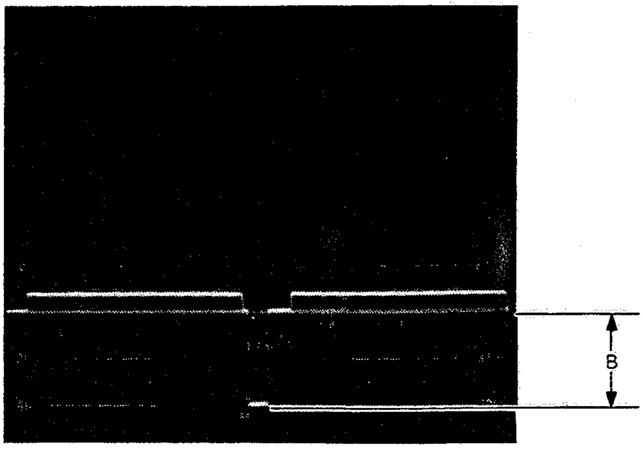
Preparation
- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

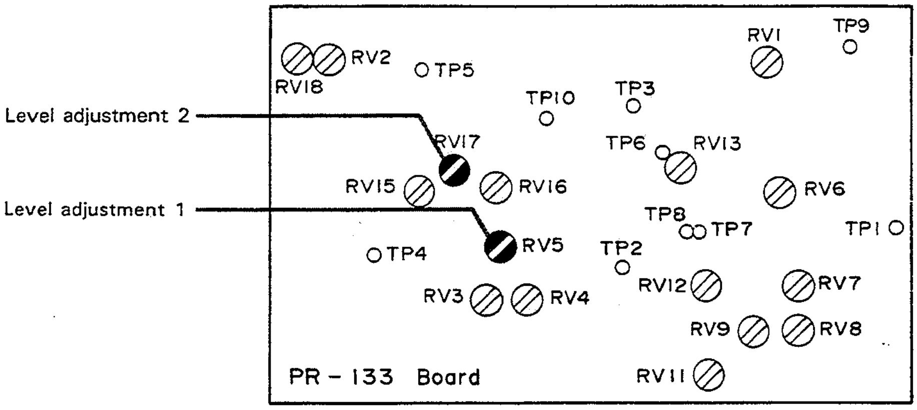
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

Level adjustment 1 (γ OFF)
Equipment: Waveform monitor
Adj. point: ⊘RV5
Spec.: A = 40 ± 4 IRE



Level adjustment 2 (γ ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV17
Spec.: B = 40 ± 4 IRE




Level adjustment 2
Level adjustment 1
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR-133 Board

(Front panel side)

4-3-6. Fixed Gain Sensitivity Adjustment

Preparation

- Subject: Grayscale chart
- Set switches on inside cover panel of the camera contorole unit as follows.

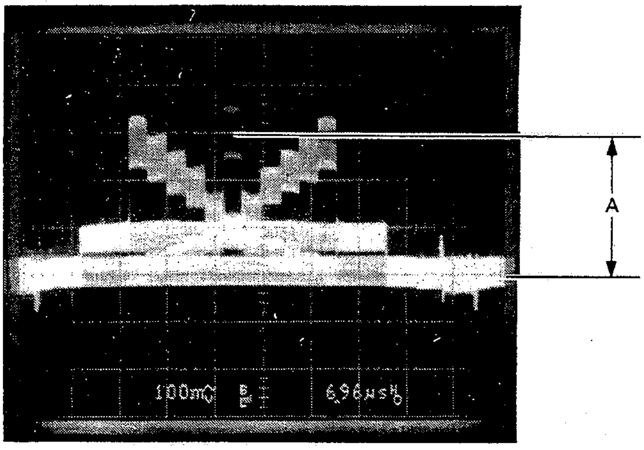
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

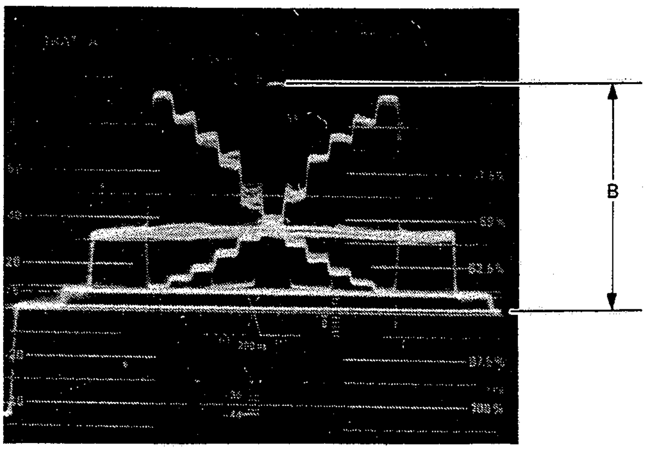
Iris adjustment

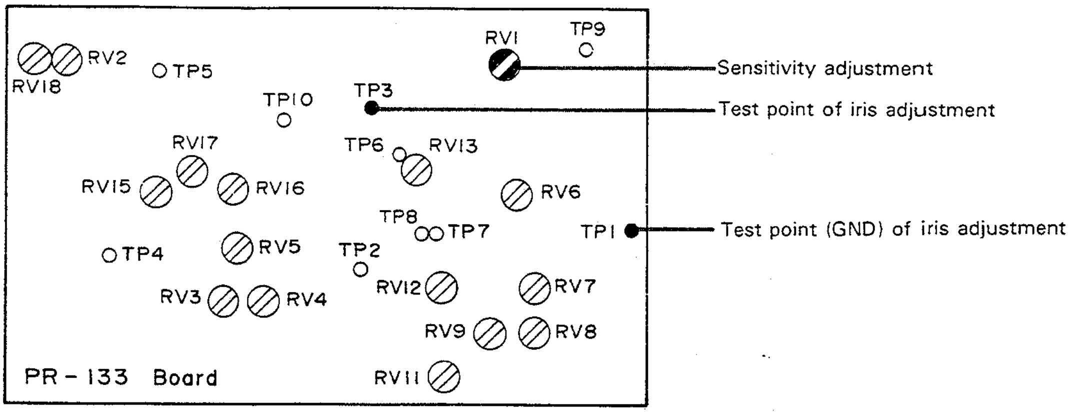
Equipment: Oscilloscope
Test point: TP3 (GND:TP1)
Adj. point: Lens iris
Spec.: A = 300 ± 3mV

Sensitivity adjustment

Equipment: Waveform monitor
Adj. point: ⊘RV1
Spec.: B = 100 ± 3 IRE






RV2
RV18
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR - 133 Board
Sensitivity adjustment
Test point of iris adjustment
Test point (GND) of iris adjustment

(Front panel side)

4-3-7. AGC Adjustment

Preparation

- Subject: Grayscale chart
- Set switches on inside cover panel of the camera contorole unit as follows.

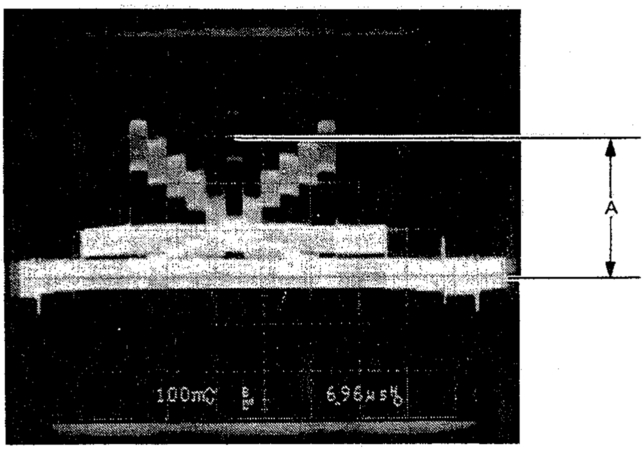
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

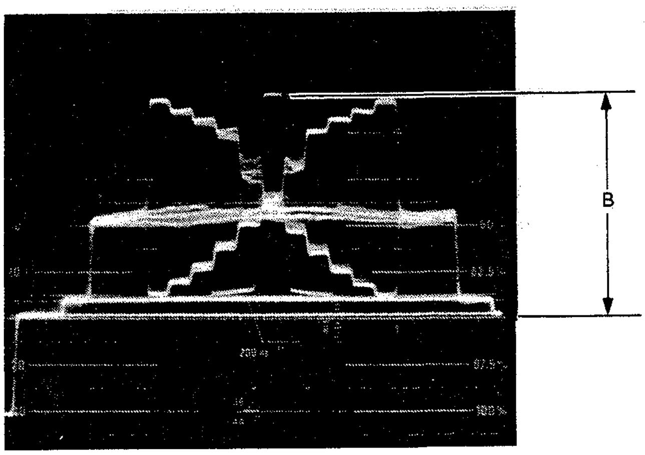
Iris adjustment(This step can be skipped when you work continuously from the preceding procedure.)

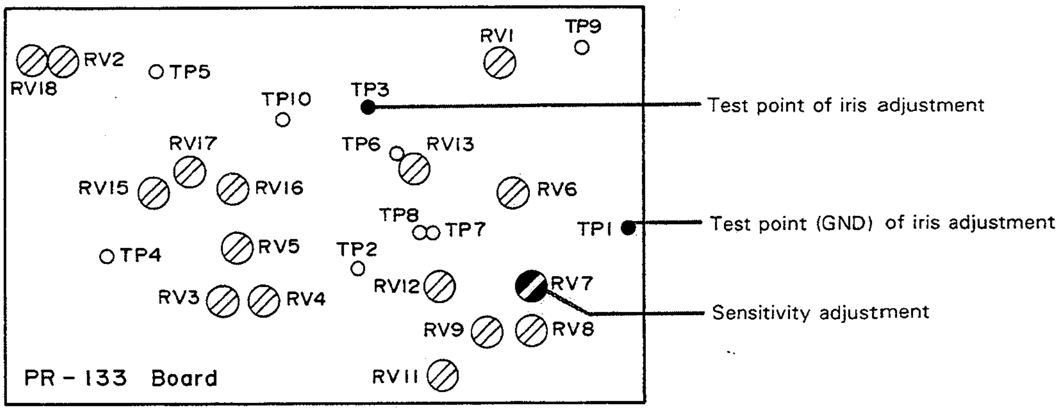
Equipment: Oscilloscope
Test point: TP3 (GND:TP1)
Adj. point: Lens iris
Spec.: A = 300 ± 3mV

Sensitivity adjustment

GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV7
Spec.: B = 100 ± 3 IRE


A
100mV
6.96μs



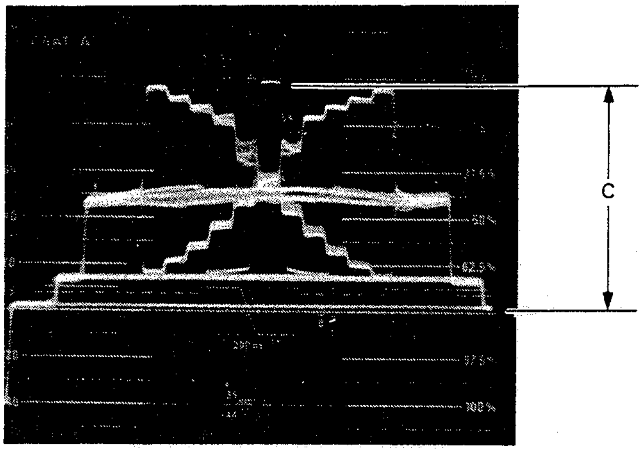

RV2
RV18
TP5
RV1
TP9
TP10
TP3
Test point of iris adjustment
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
Test point (GND) of iris adjustment
TP4
RV5
TP2
RV12
RV7
RV3
RV4
Sensitivity adjustment
RV9
RV8
PR - 133 Board
RV11

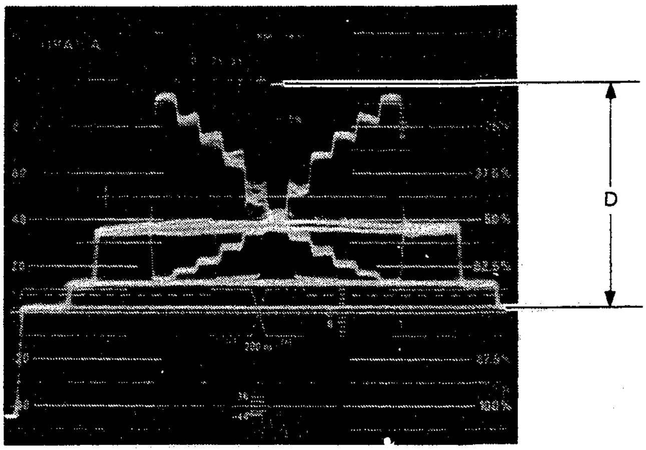
(Front panel side)

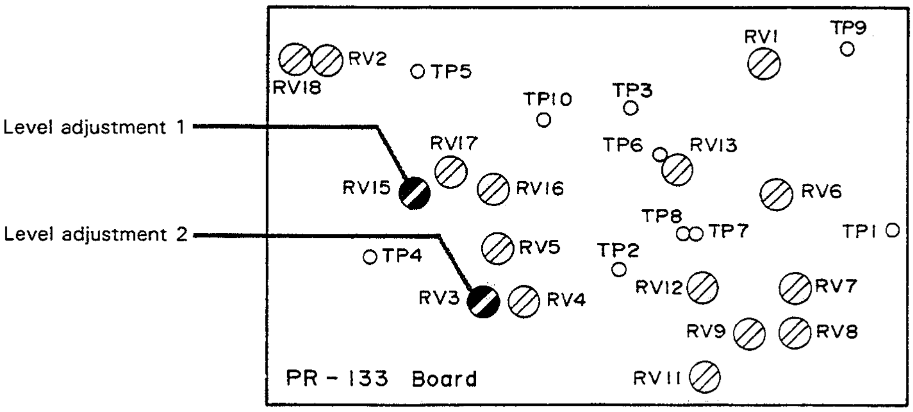
(AGC Adjustment, continued)

Level adjustment 1 (γ ON)
AGC ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV15
Spec.: C = 100 ± 3 IRE

Level adjustment 2 (γ OFF)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV3
Spec.: D = 100 ± 3 IRE





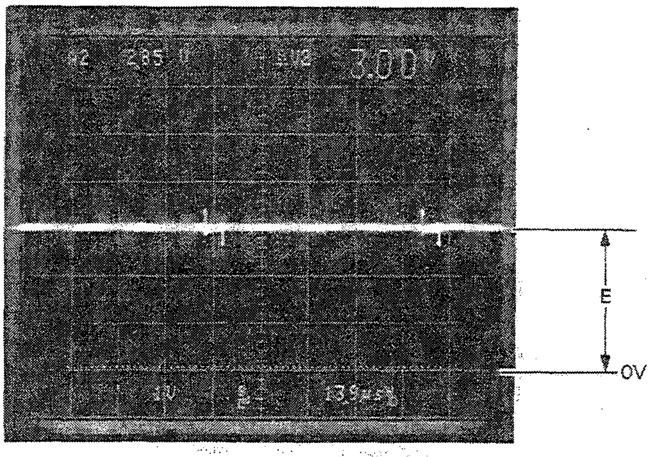

Level adjustment 1
Level adjustment 2
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
RV15
RV16
TP6
RV13
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR - 133 Board

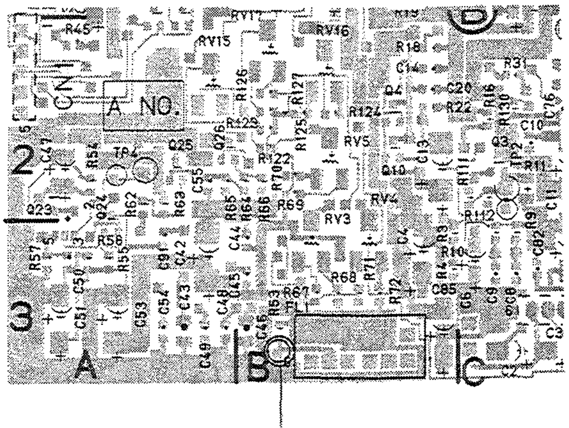
(Front panel side)

(AGC Adjustment, continued)

Maximum gain adjustment

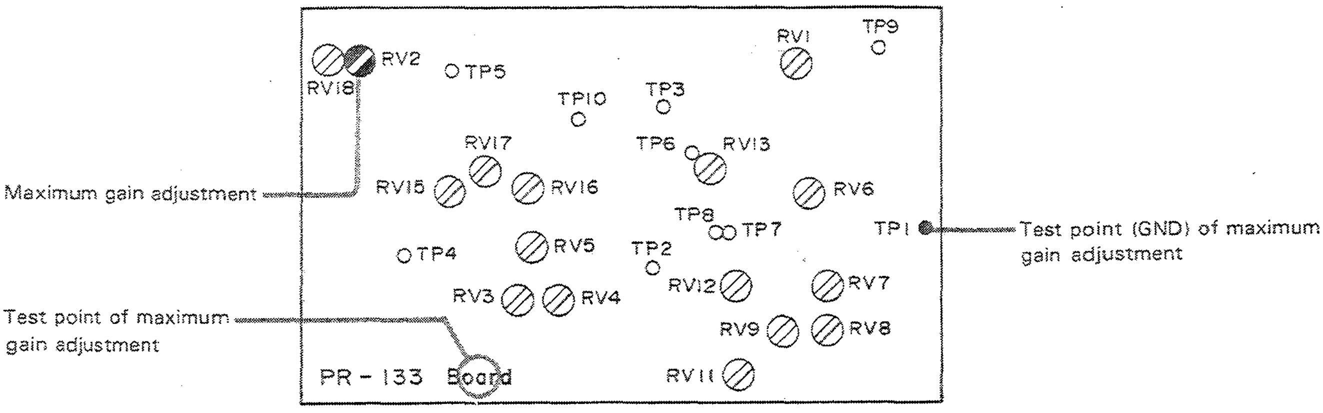
Lens iris: Closed
Equipment: Oscilloscope
Test point: Refer to right figure (GND:TP1)
Adj. point: ⊘RV2
Spec.: E=3.0±0.2V





The maximum gain adjustment is to be made at this throughholerand.

Continue on to "4-3-8. White Clipping Adjustment"


RV2
RV18
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR-133 Board
Maximum gain adjustment
Test point of maximum gain adjustment
Test point (GND) of maximum gain adjustment

(Front panel side)

4-3-8. White Clipping Adjustment

Preparation

- Subject: White chart (Shoot only the pattern box.)
- Lens iris: Open
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
ON	OFF	OFF	FRM	2 : 1	OFF

AGC minimum gain adjustment

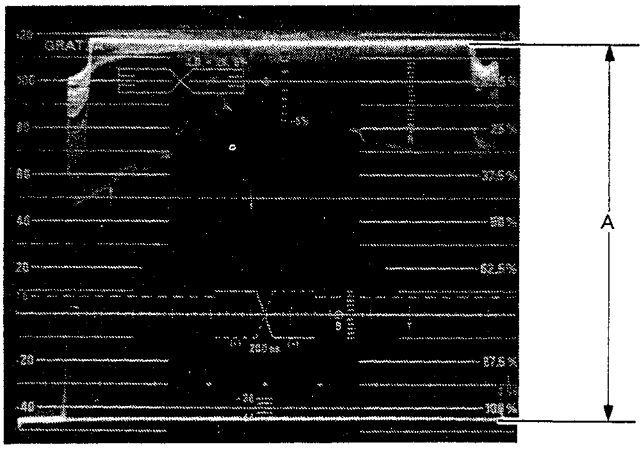
(Perform this procedure only when you work continuously from the AGC adjustment procedure.)

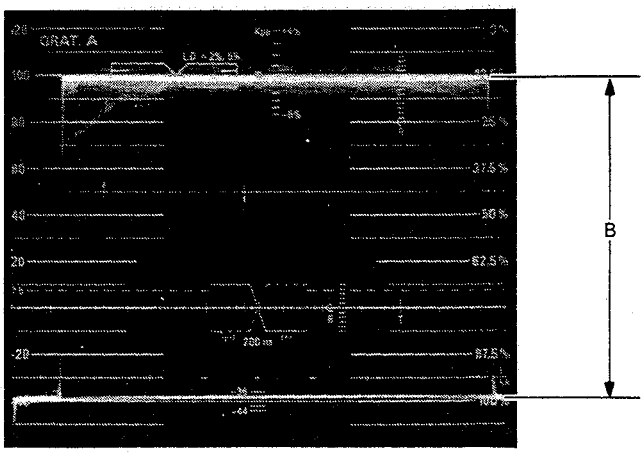
- Adjust ⊘ RV9 so as to obtain the maximum "A."

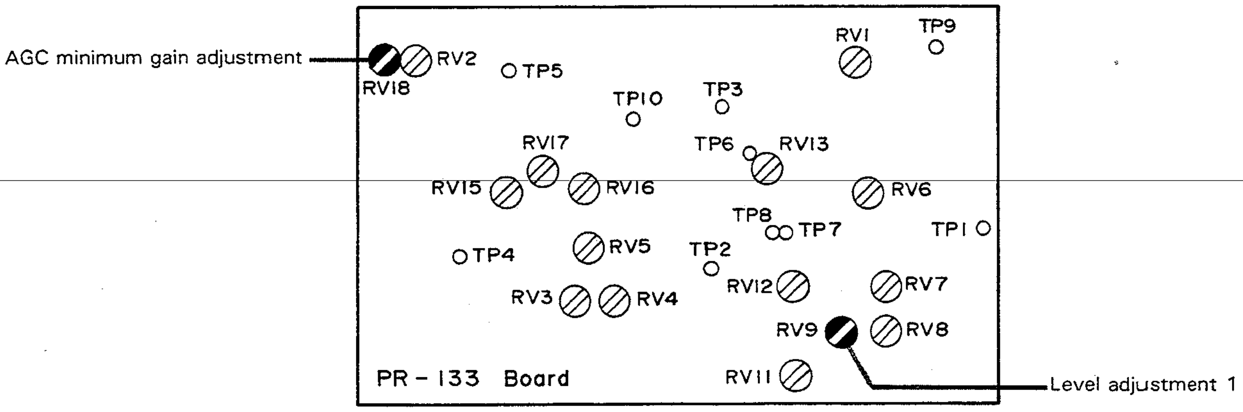
Equipment: Waveform monitor
Adj. point: ⊘ RV18
Spec.: A = 170 ± 5 IRE

Level adjustment 1 (γ OFF, WC OFF)

AGC ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV9
Spec.: B = 140 ± 5 IRE






AGC minimum gain adjustment
RV18
RV2
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR - 133 Board
RV11
Level adjustment 1

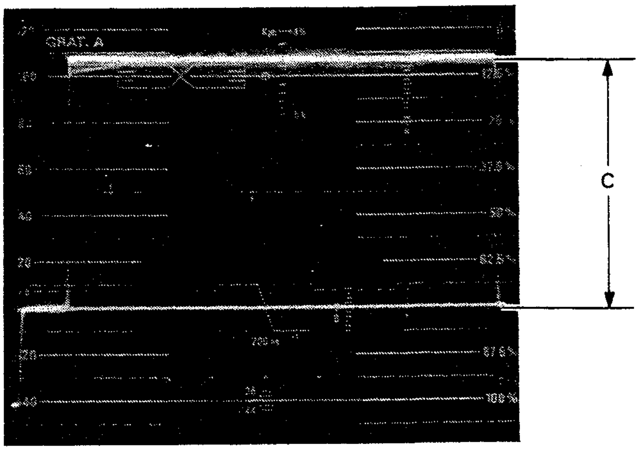
(Front panel side)

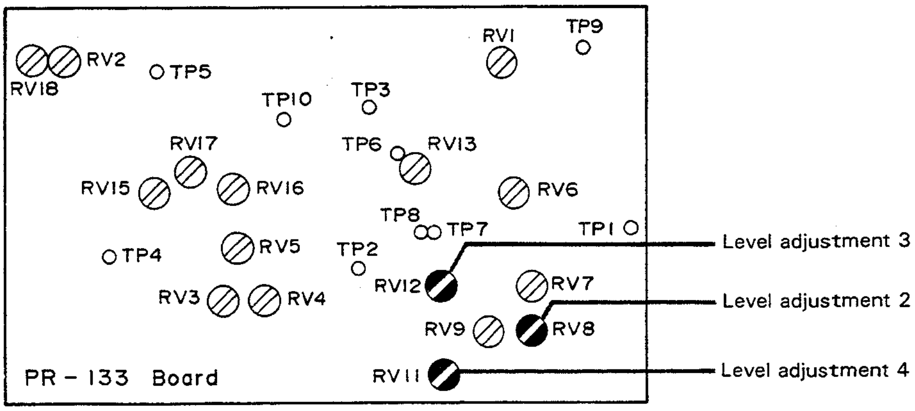
(White Clipping Adjustment, continued)

Level adjustment 2 (γ OFF, WC ON)
WHTCLP ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV8
Spec.: C = 110 ± 5 IRE

Level adjustment 3 (γ ON, WC ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV12
Spec.: C = 110 ± 5 IRE

Level adjustment 4 (γ ON, WC OFF)
WHTCLP ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV11
Spec.: C = 110 ± 5 IRE




RV18
RV2
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
RV11
PR – 133 Board
Level adjustment 3
Level adjustment 2
Level adjustment 4

(Front panel side)

SECTION 2
COMPREHENSIVE SPECIFICATIONS

2-1. SPECIFICATIONS

<XC-77RR-CE CCD video camera module>

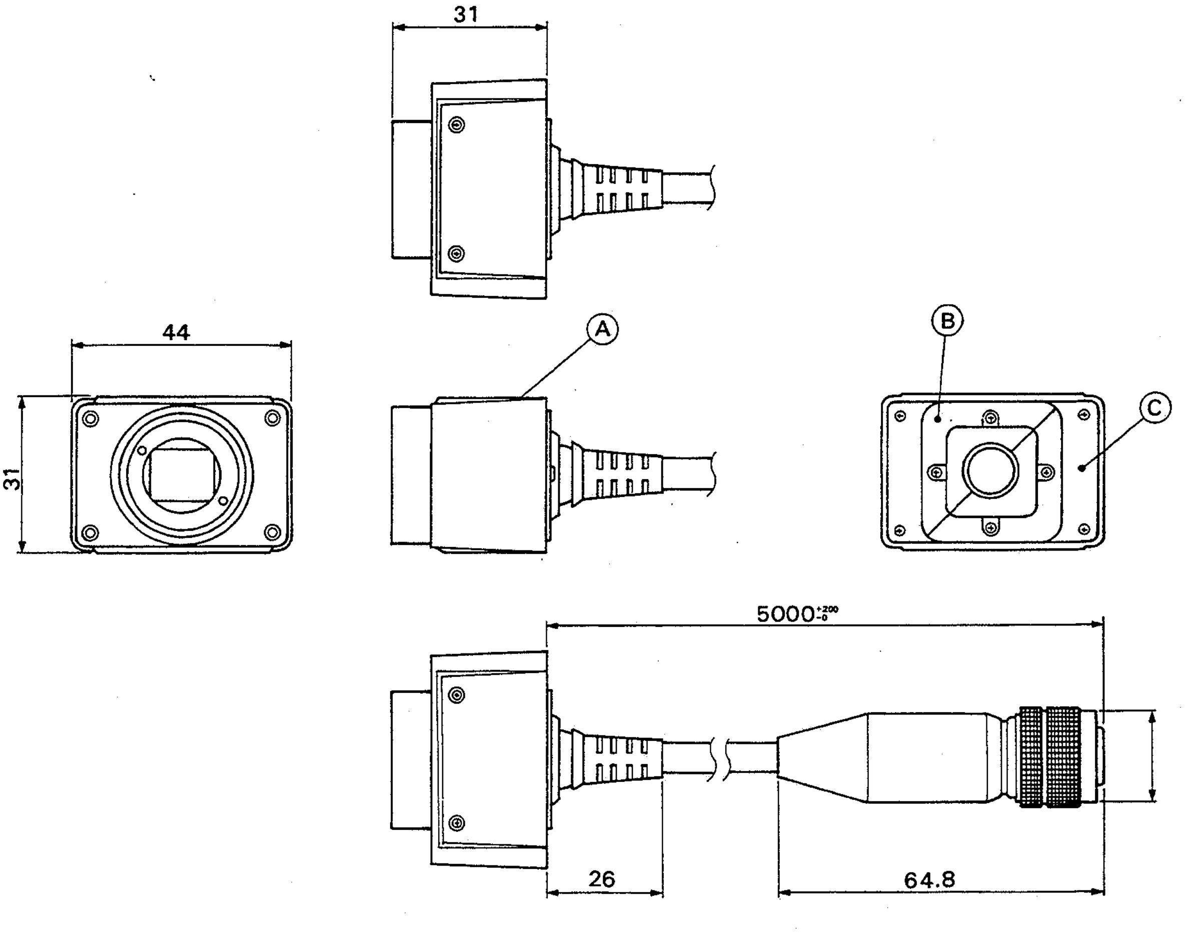
Pickup device	Interline transfer CCD
Picture elements	756 (H) x 581 (V)
Sensing area	8.8 x 6.6 mm (equivalent to the 2/3-inch camera tube)
Optical black	60 pixels each horizontal line
CCD vertical drive frequency	15.624 kHz ± 1%
CCD horizontal drive frequency	14.1875 MHz
Signal system	CCIR standard
Cell size	11 (H) x 11 (V) μm
Chip size	10.0 (H) × 8.2 (V) mm

Optical and others

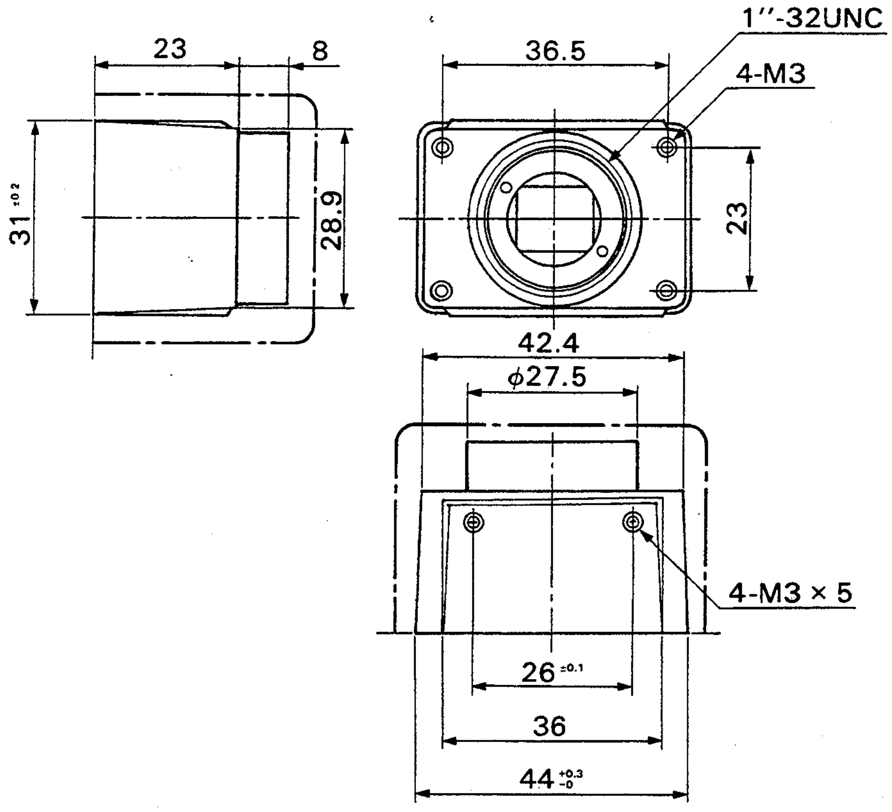
Lens mount	C mount
Flange back length	17.526 mm
Sync system	Internal/External, selectable with the internal switch
External sync input	S/VS/VBS (sync level: 0.3 Vp-p ± 6 dB) HD and VD (signal level: 2 to 5 Vp-p)
External sync frequency tolerance	± 1% (to horizontal sync frequency)
Jitter	Within ± 50 nsec
Scanning system	625 lines 2 : 1 interlace/non-interlace, selectable with the internal switch
Video output	1.0 Vp-p sync negative, 75 Ω unbalanced
Horizontal resolution	560 TV lines
Vertical effective lines	2 : 1 interlace 575 lines
Sensitivity	400-lux with F4 (γ ON/0 dB)
Minimum illumination	5.0-lux with (AGC: ON, F1.4, γ ON)
S/N ratio	54 dB
Gain	Auto gain control/fixed gain, selectable with the switch
Gamma	Gamma correction/gamma = 1, selectable with the switch
White clip	110% ± 10%/140% ± 10%, selectable with the switch
Charge mode	Frame/Field, selectable with the switch
Shutter mode	Normal shutter mode/DONPISHA shutter mode, selectable with the switch
Shutter speed	Normal shutter mode: 1/52 to 1/12,360,000 sec. DONPISHA shutter mode: 1/3.6 to 1/1360 sec.
Power requirement	12 V DC
Power voltage tolerance	10.5 to 15 V DC
Power consumption	5.5 W
Operating temperature	−5 to + 45°C (+ 23 to + 113°F)
Storage temperature	−25 to + 60°C (−13 to + 140°F)
Operating humidity	20 to 80% (without condensation)
Storage humidity	20 to 95% (without condensation)
Shock resistance	70 G
High vibration resistance	7G
Dimension	Camera head unit: 44 x 31 x 23 mm (w/h/d), ($1^{3}/_{4}$ x $1^{1}/_{4}$ x $^{29}/_{32}$ inches), not including the cable Camera control unit: 135 x 30 x 70 mm (w/h/d), ($5^{3}/_{8}$ x $1^{3}/_{16}$ x $2^{7}/_{8}$ inches)
Weight	Camera head unit: About 400 g (14 oz), including the cable Camera control unit: About 370 g (13 oz)
Supplied accessory	Lens mount cap (1) Cable clamp (1 set) Stopper (1) Cable fixture (1 set) Operation manual (1)

DIMENSIONS: (unit: mm)
CAMERA MODULE <XC-77RR-CE>

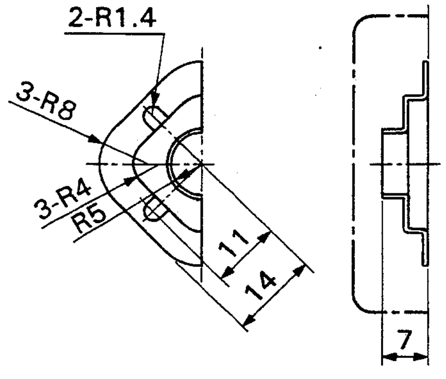
CAMERA HEAD UNIT


31
44
31
A
B
C
5000+200 -0
26
64.8

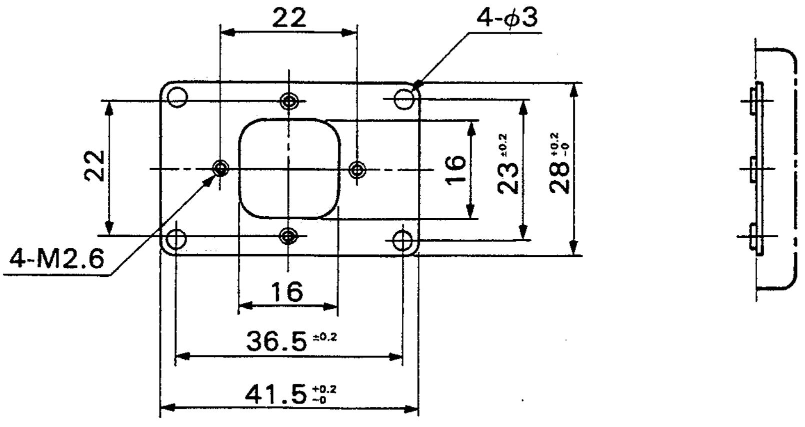
Ⓐ


23
8
31 ±0.2
28.9
36.5
1"-32UNC
4-M3
23
42.4
φ27.5
4-M3 × 5
26 ±0.1
36
44 +0.3 -0

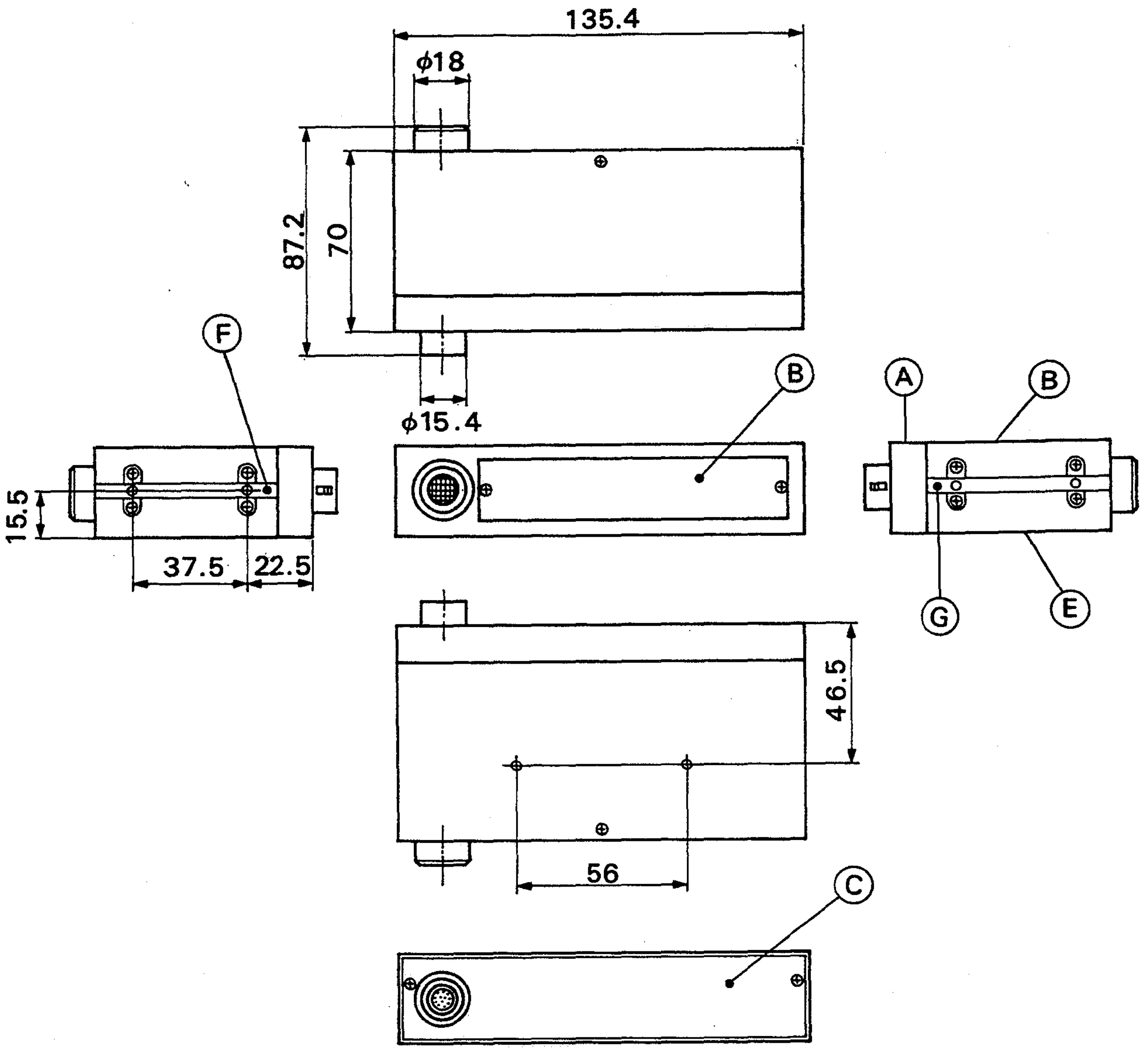
Ⓑ


2-R1.4
3-R8
3-R4
R5
11
14
7

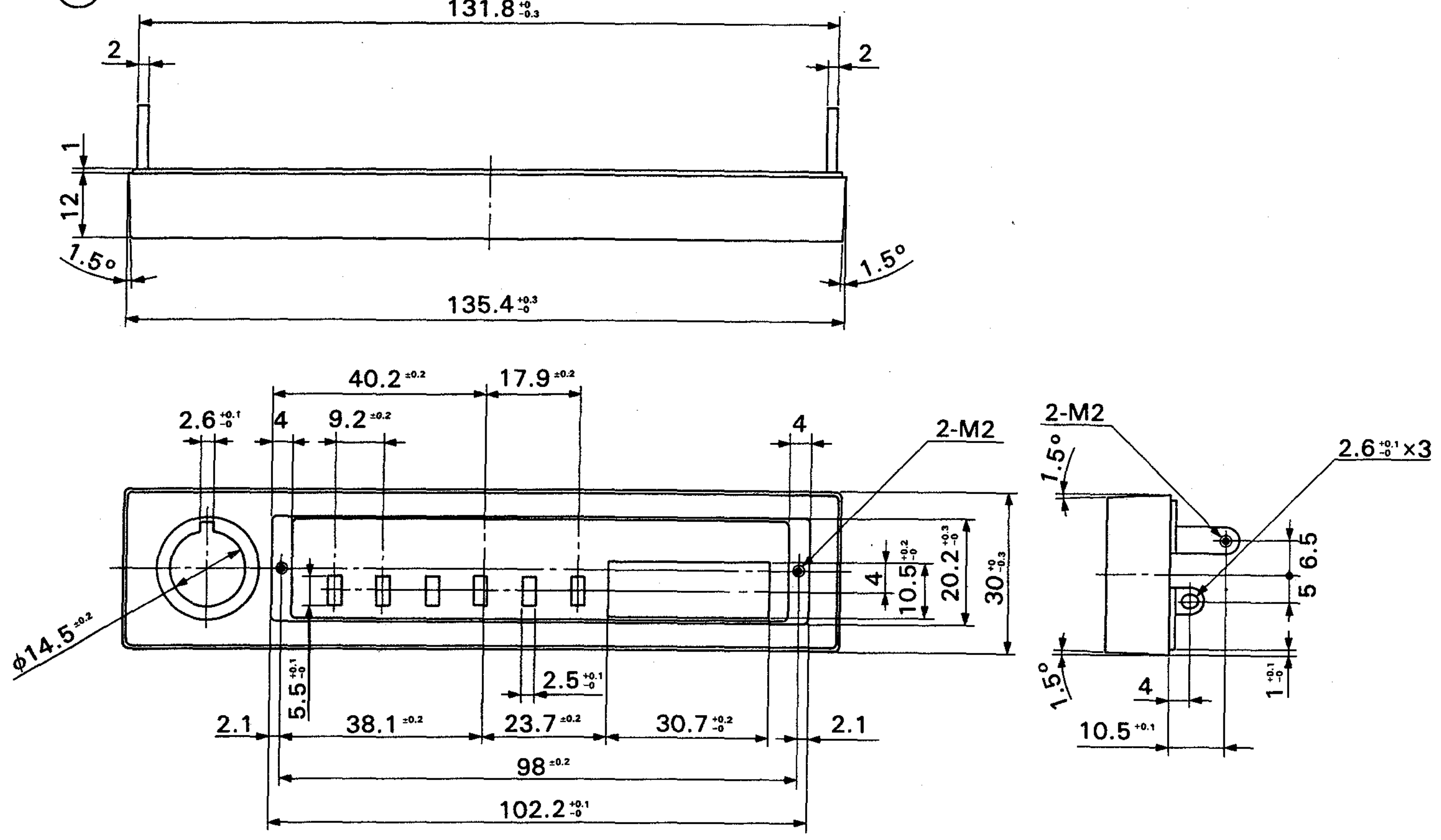
Ⓒ


22
4-φ3
22
16
23 ±0.2
28 +0.2 -0
4-M2.6
16
36.5 ±0.2
41.5 +0.2 -0

CAMERA CONTROL UNIT

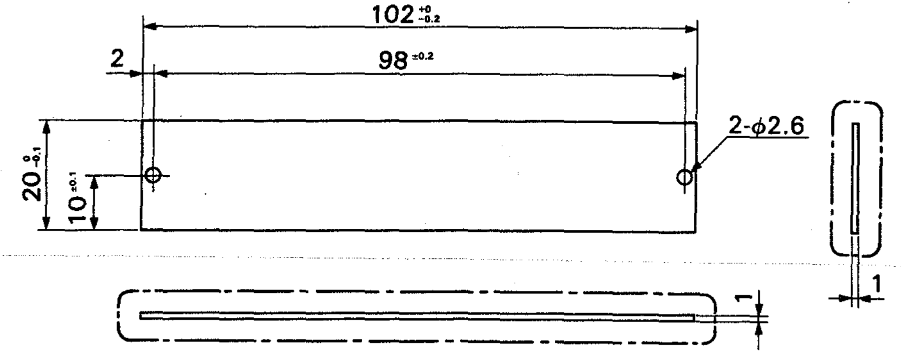

135.4
φ18
87.2
70
φ15.4
15.5
37.5
22.5
46.5
56
A
B
C
E
F
G

Ⓐ



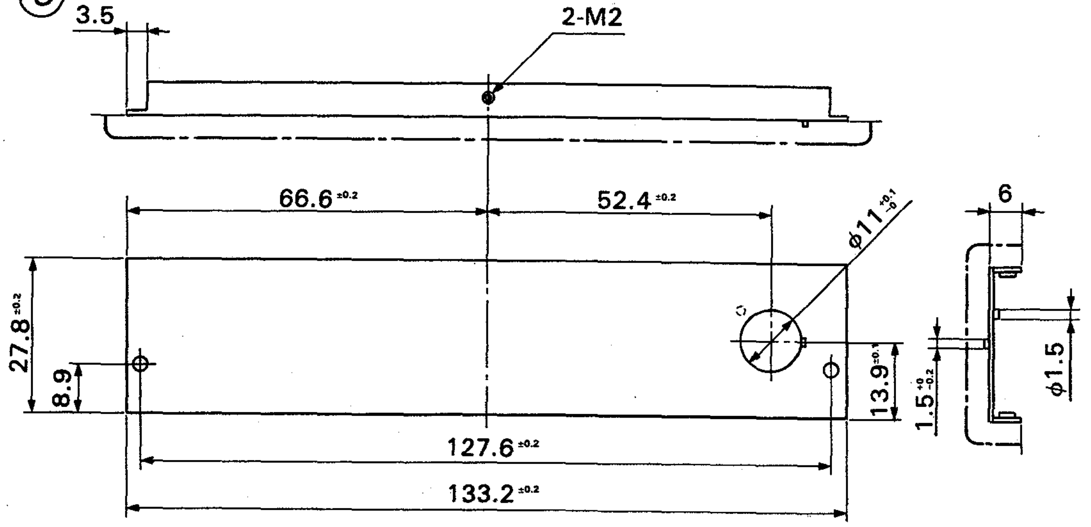
131.8 +0 -0.3
2
2
1
12
1.5°
1.5°
135.4 +0.3 -0
40.2 ±0.2
17.9 ±0.2
2.6 +0.1 -0
4
9.2 ±0.2
4
2-M2
4
10.5 +0.2 -0
20.2 +0.3 -0
30 +0 -0.3
φ14.5 ±0.2
5.5 +0.1 -0
2.5 +0.1 -0
2.1
38.1 ±0.2
23.7 ±0.2
30.7 +0.2 -0
2.1
98 ±0.2
102.2 +0.1 -0
2-M2
2.6 +0.1 -0 ×3
1.5°
6.5
5
1.5°
4
1 +0.1 -0
10.5 ±0.1

Ⓑ



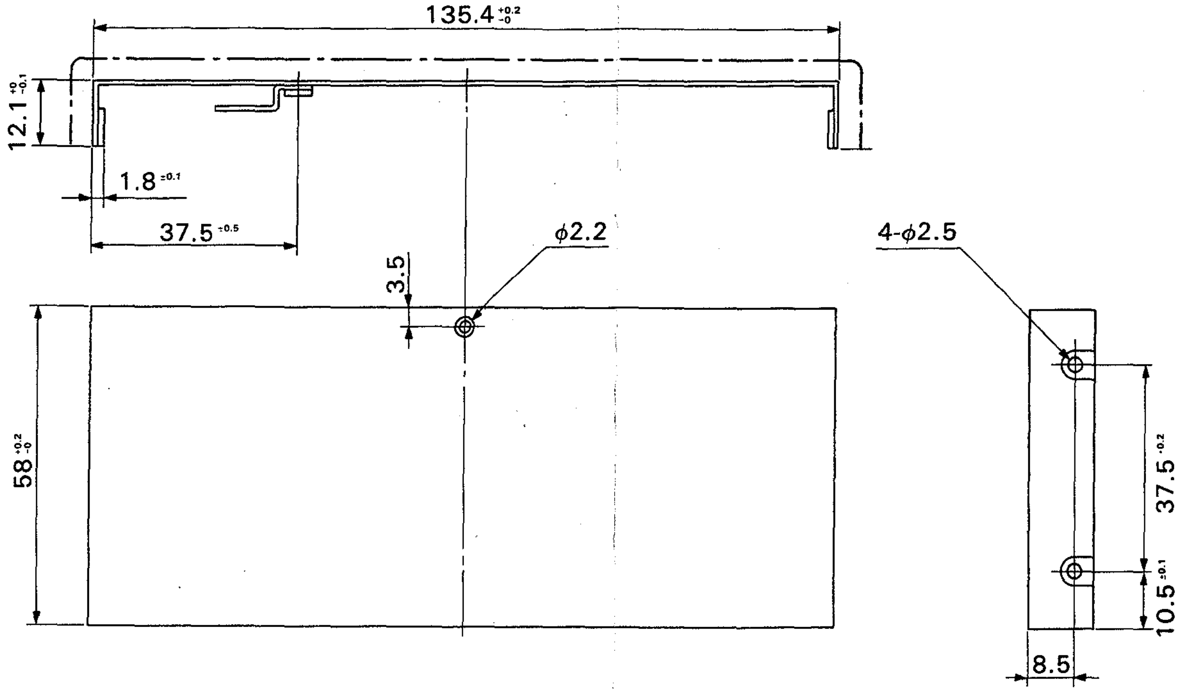
102 +0 -0.2
2
98 ±0.2
2-φ2.6
20 +0 -0.1
10 ±0.1
1
1

Ⓒ



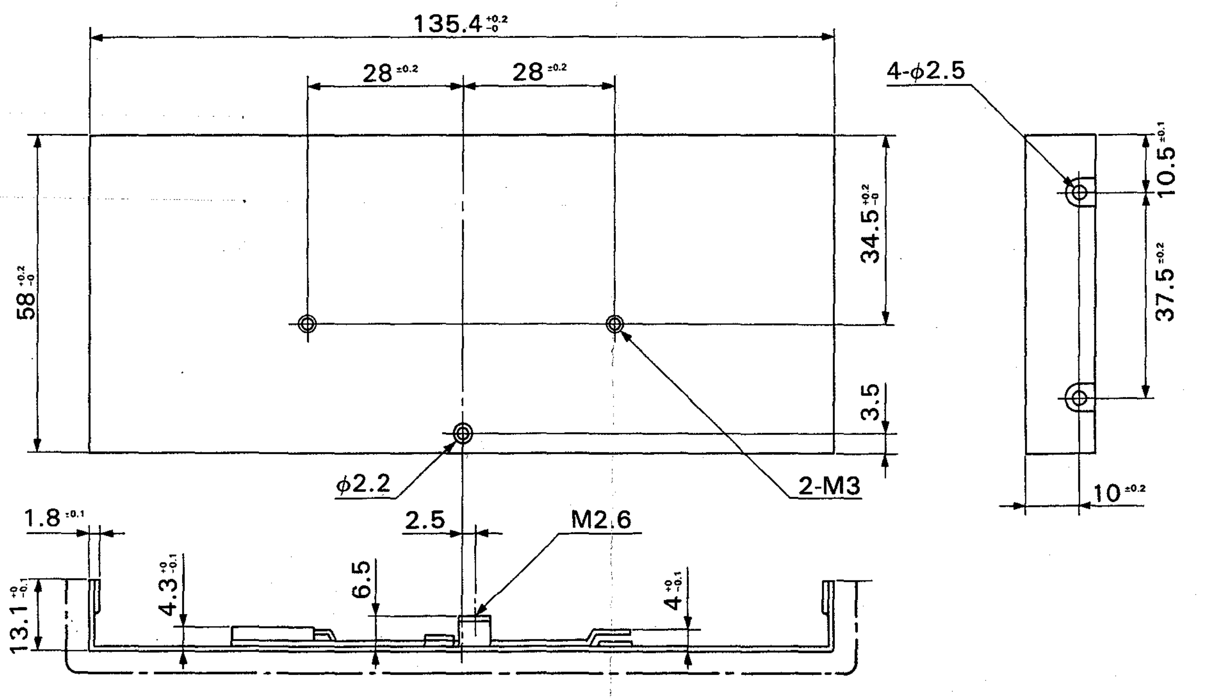
3.5
2-M2
66.6 ±0.2
52.4 ±0.2
φ11 +0.1 -0
6
27.8 ±0.2
8.9
13.9 ±0.1
1.5 +0 -0.2
φ1.5
127.6 ±0.2
133.2 ±0.2

Ⓓ



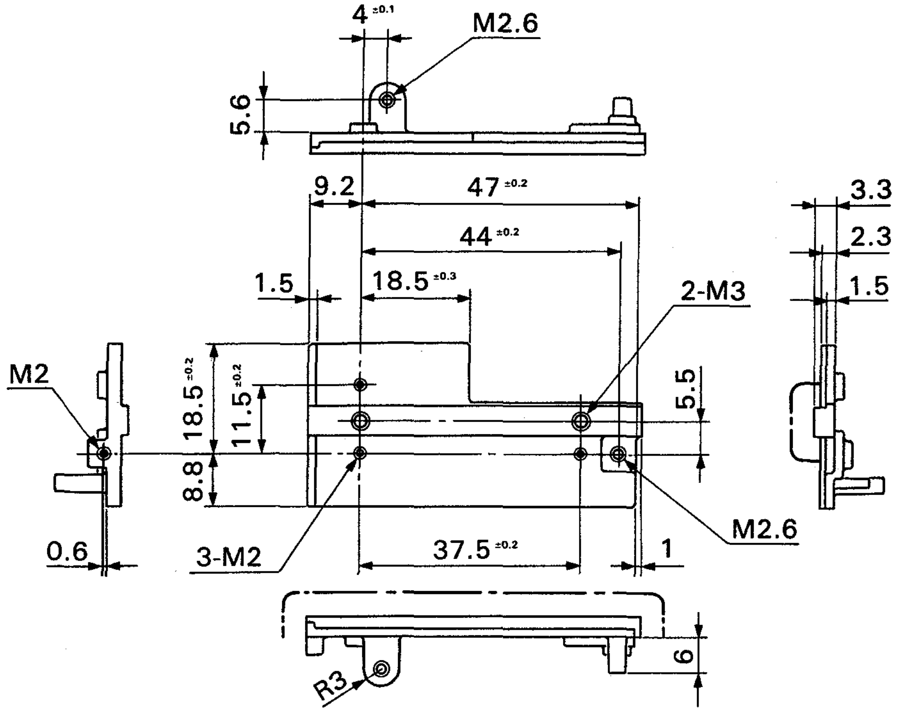
135.4 +0.2 -0
12.1 +0 -0.1
1.8 ±0.1
37.5 ±0.5
φ2.2
4-φ2.5
3.5
58 +0.2 -0
37.5 +0 -0.2
10.5 ±0.1
8.5

Ⓔ

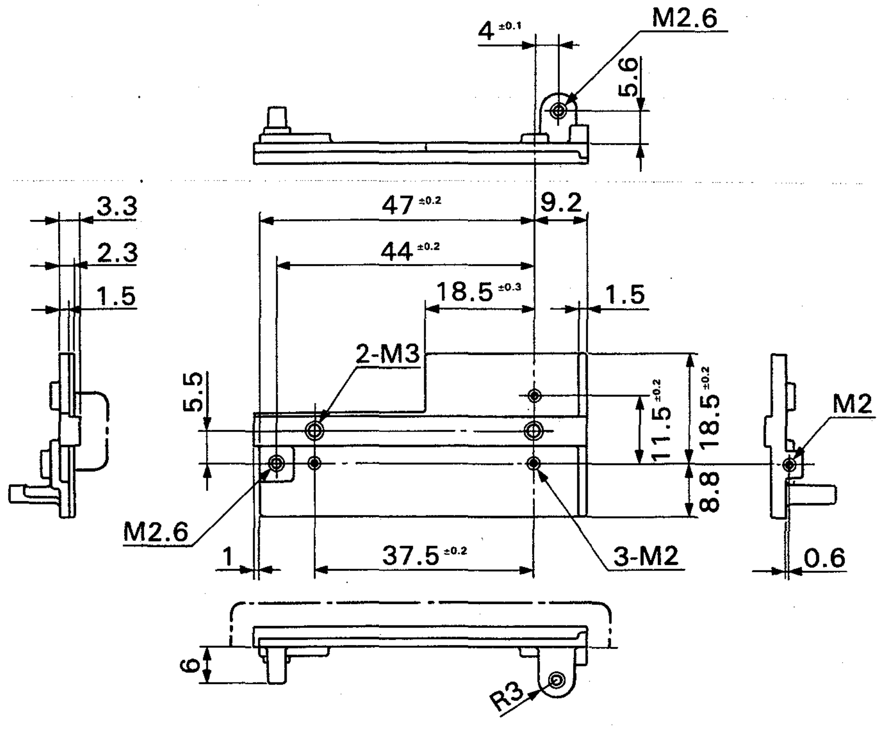


135.4 +0.2 -0
28 ±0.2
28 ±0.2
4-φ2.5
10.5 ±0.1
34.5 +0.2 -0
58 +0.2 -0
37.5 ±0.2
3.5
φ2.2
2-M3
10 ±0.2
1.8 ±0.1
2.5
M2.6
13.1 +0 -0.1
4.3 +0 -0.1
6.5
4 +0 -0.1

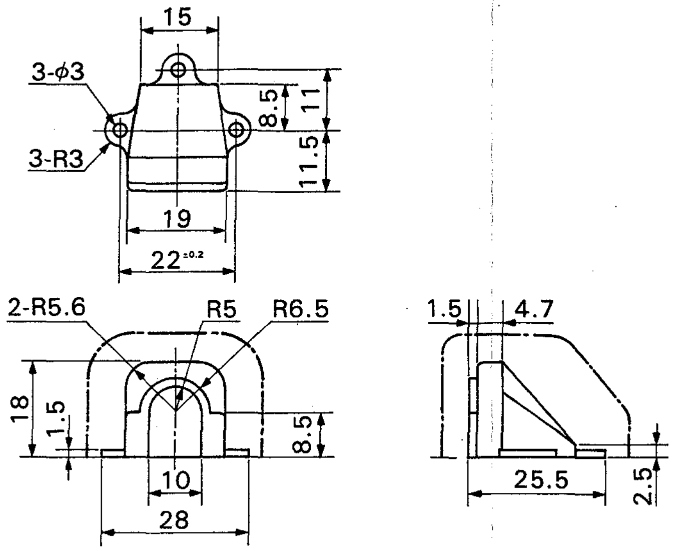
Ⓕ


4 ±0.1
M2.6
5.6
9.2
47 ±0.2
44 ±0.2
3.3
2.3
1.5
1.5
18.5 ±0.3
2-M3
1.5
M2
18.5 ±0.2
11.5 ±0.2
5.5
8.8
0.6
3-M2
37.5 ±0.2
1
M2.6
6
R3

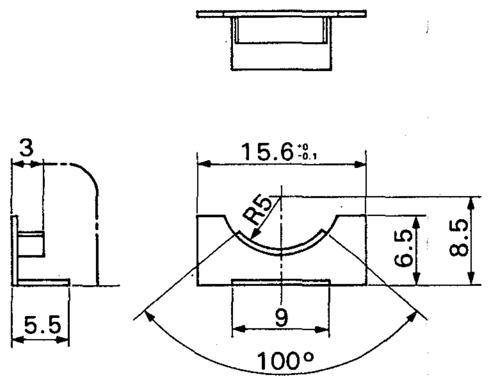
Ⓖ


4 ±0.1
M2.6
5.6
3.3
47 ±0.2
9.2
2.3
44 ±0.2
1.5
18.5 ±0.3
1.5
2-M3
5.5
11.5 ±0.2
18.5 ±0.2
M2
8.8
M2.6
1
37.5 ±0.2
3-M2
0.6
6
R3

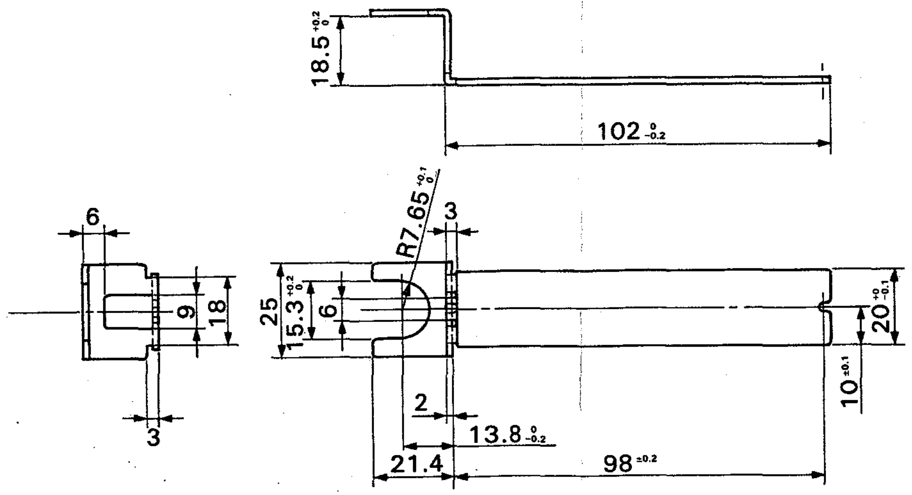
Cable clamp


15
3-φ3
3-R3
8.5
11
11.5
19
22 ±0.2
2-R5.6
R5
R6.5
1.5
4.7
18
1.5
8.5
10
28
25.5
2.5

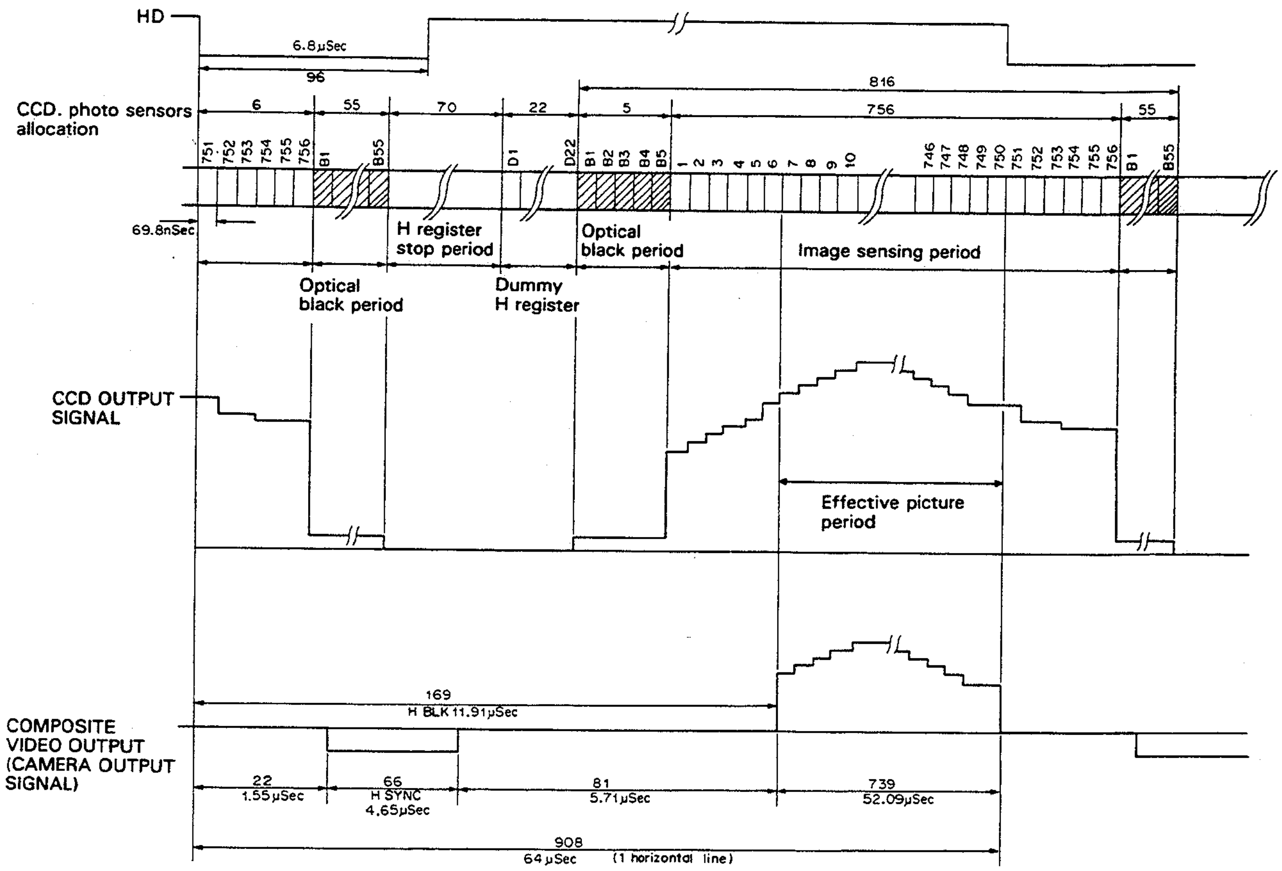
Stopper


3
15.6 +0 -0.1
R5
6.5
8.5
5.5
9
100°

Cable fixture


18.5 +0.2 0
102 0 -0.2
R7.65 +0.1 0
3
6
9
18
25
15.3 ±0.2
6
20 +0 -0.1
10 ±0.1
3
2
13.8 0 -0.2
21.4
98 ±0.2

2-2. OUTPUT SIGNAL TIMING CHART


HD
6.8µSec
96
816
CCD. photo sensors allocation
6
55
70
22
5
756
55
751
752
753
754
755
756
B1
B55
D1
D22
B1
B2
B3
B4
B5
1
2
3
4
5
6
7
8
9
10
746
747
748
749
750
751
752
753
754
755
756
B1
B55
69.8nSec
H register stop period
Optical black period
Image sensing period
Optical black period
Dummy H register
CCD OUTPUT SIGNAL
Effective picture period
169
H BLK 11.91µSec
COMPOSITE VIDEO OUTPUT (CAMERA OUTPUT SIGNAL)
22
1.55µSec
66
H SYNC
4.65µSec
81
5.71µSec
739
52.09µSec
908
64µSec (1 horizontal line)

2-3. EXTERNAL SYNCHRONIZATION

There are three external synchronization modes:
1. S/VS/VBS mode
2. HD and VD mode
3. RESTART RESET mode

2-3-1. S/VS/VBS Mode

The S/VS/VBS mode provides external synchronization by supplying a normal composite signal, S, VS or VBS, to pin 7 of the 12-pin connector.

2-3-2. HD and VD Mode

The HD and VD mode provides external synchronization by supplying an HD signal to pin 6 and a VD signal to pin 7 of the 12-pin connector.

- **Input conditions of HD and VD signals**
- Frequency (period)

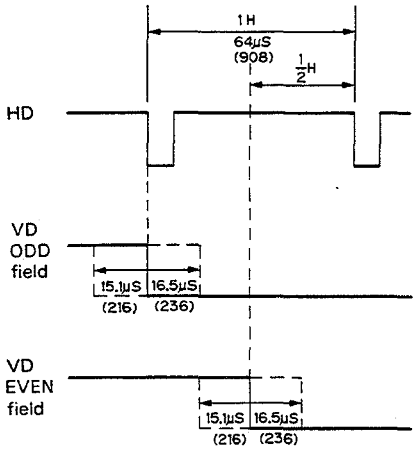
  HD: 15.625 KHz ± 1% (64 μs ± 1%)

  VD: 294 to 1023 1/2 H

  *The maximum number of vertical effective lines is 581 in the interlace mode.

  In the non-interlace mode, it is 290 for both the ODD field and the EVEN field.

- Phase



The figure in parentheses ( ) indicates the number of clock pulses

As shown in the illustration above, the ODD field is provided when the phase shift between the trailing edge of the VD signal and the trailing edge of the HD signal is between a lead of 15.1 μs and a lag of 16.5 μs. The EVEN field is provided when the phase shift between the trailing edge of the VD signal and the point 1/2H from the trailing edge of the HD signal is between a lead of 15.1 μs and a lag of 16.5 μs.

- **Interlace and non-interlace**

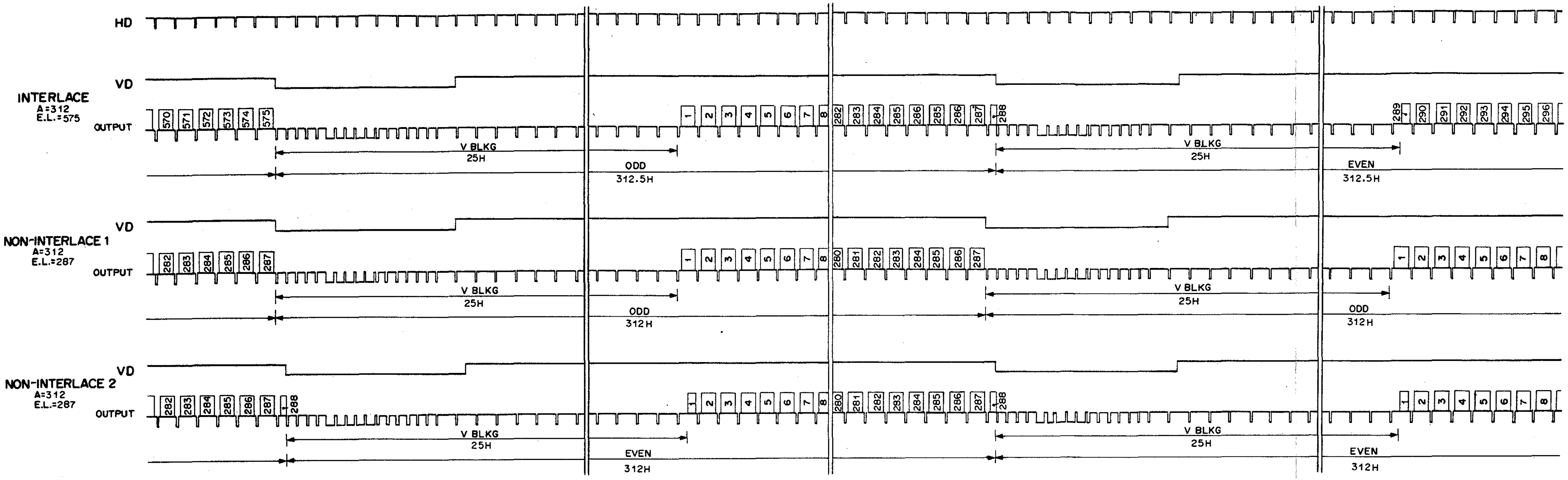
*Operation can be performed in either interlace or non-*interlace mode by changing the input condition of the VD signal. See Figure 1.

- Interlace

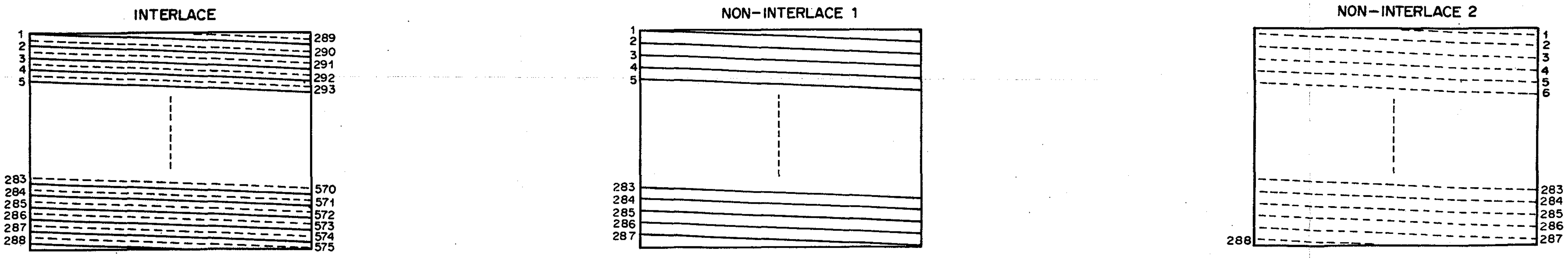
To operate in the interlace mode, set the period of the VD signal to (A + 1/2) H.A is an integer, 294 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is changed for each VD signal. The field changes from ODD to EVEN and to ODD, repeatedly during operation in the interlace mode. At this time, the number of scanning lines per frams is 2A + 1.

- Non-interlace

To operate in the non-interlace mode, set the period of the VD signal to A H. A is an integer, 294 to 1023. In other words, the phase of the leading edge of the VD signal against the leading edge of the HD signal is not changed for each VD signal, and the field ODD or EVEN remains unchanged for operation in the non-interlace mode. The number of scanning lines is A; this is half of the number of scanning lines for operation in the interlace mode. The sensitivity is half of the sensitivity provided in the interlace *mode, when the frame is stored. See Figure 2.*

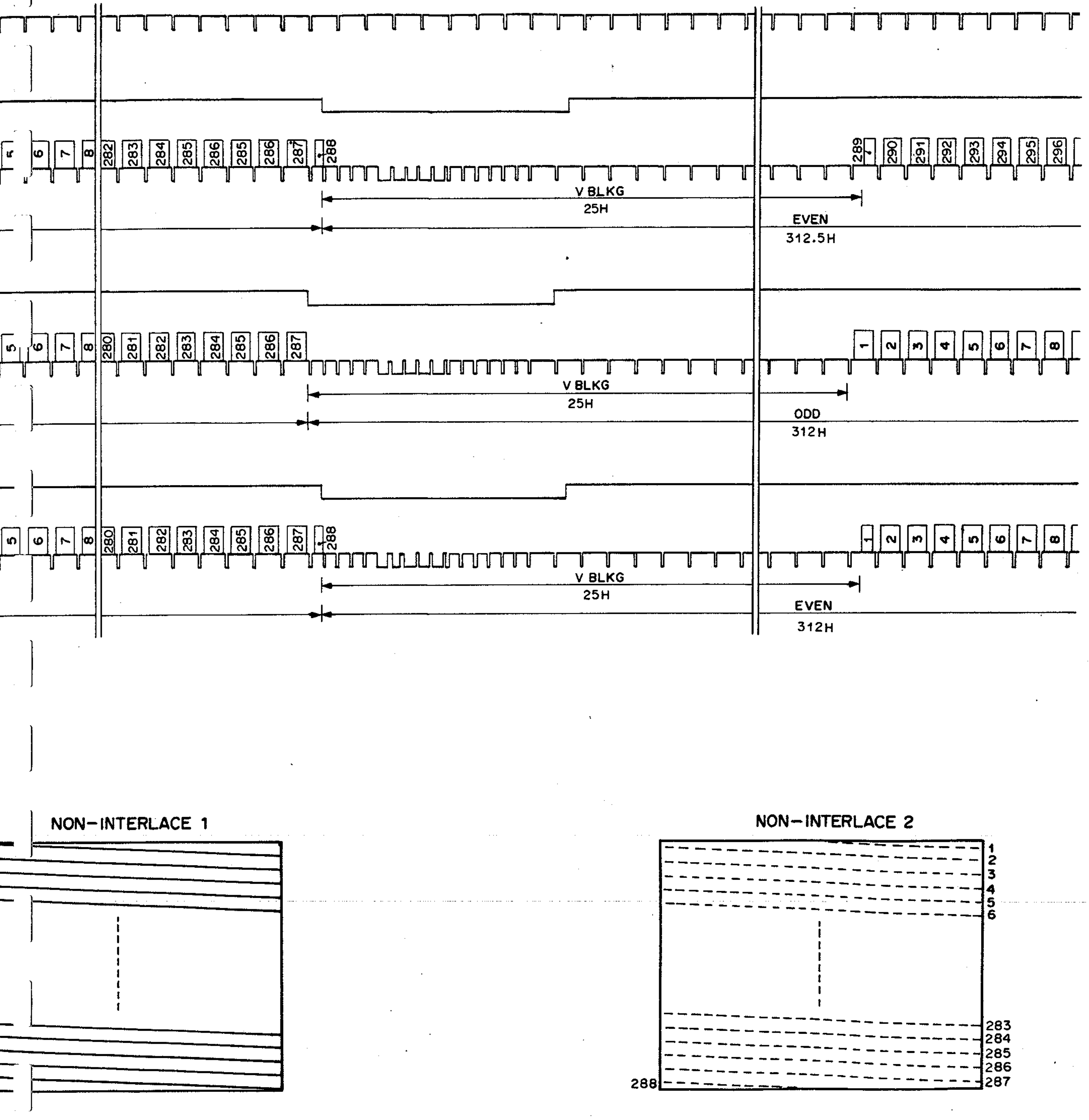

HD
VD
INTERLACE
A=312
E.L.=575
OUTPUT
570 571 572 573 574 575
1 2 3 4 5 6 7 8
282 283 284 285 286 285 286 287 288
289 290 291 292 293 294 295 296
V BLKG
25H
ODD
312.5H
EVEN
312.5H
VD
NON-INTERLACE 1
A=312
E.L.=287
OUTPUT
282 283 284 285 286 287
280 281 282 283 284 285 286 287
V BLKG
25H
ODD
312H
VD
NON-INTERLACE 2
A=312
E.L.=287
OUTPUT
V BLKG
25H
EVEN
312H

Note: EL means effective line

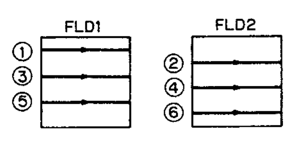
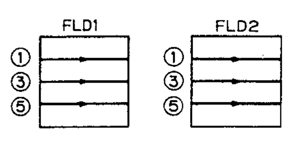
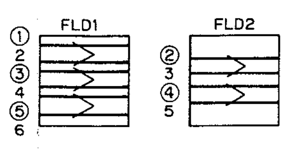
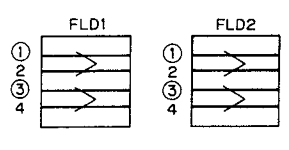
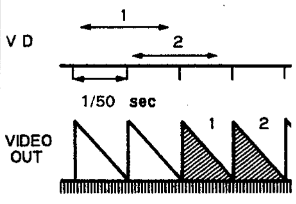
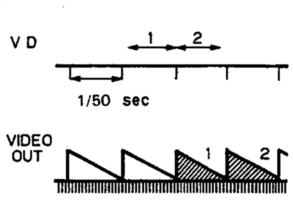
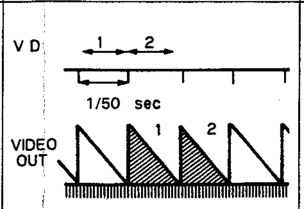
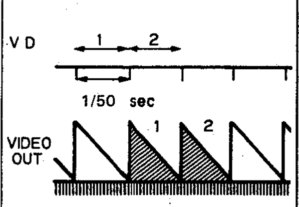
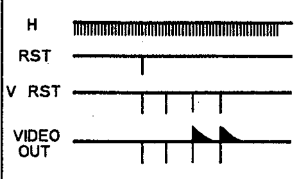
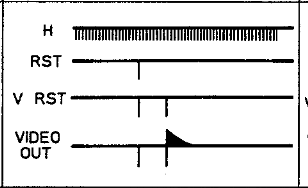
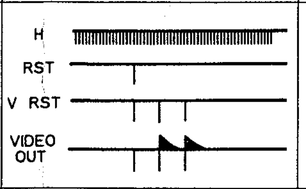
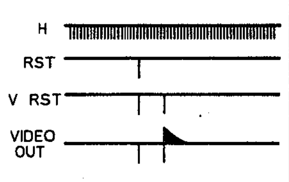

INTERLACE
1 2 3 4 5
283 284 285 286 287 288
289 290 291 292 293
570 571 572 573 574 575
NON-INTERLACE 1
1 2 3 4 5
283 284 285 286 287
NON-INTERLACE 2
1 2 3 4 5 6
283 284 285 286 287
288

[Fig. 1]

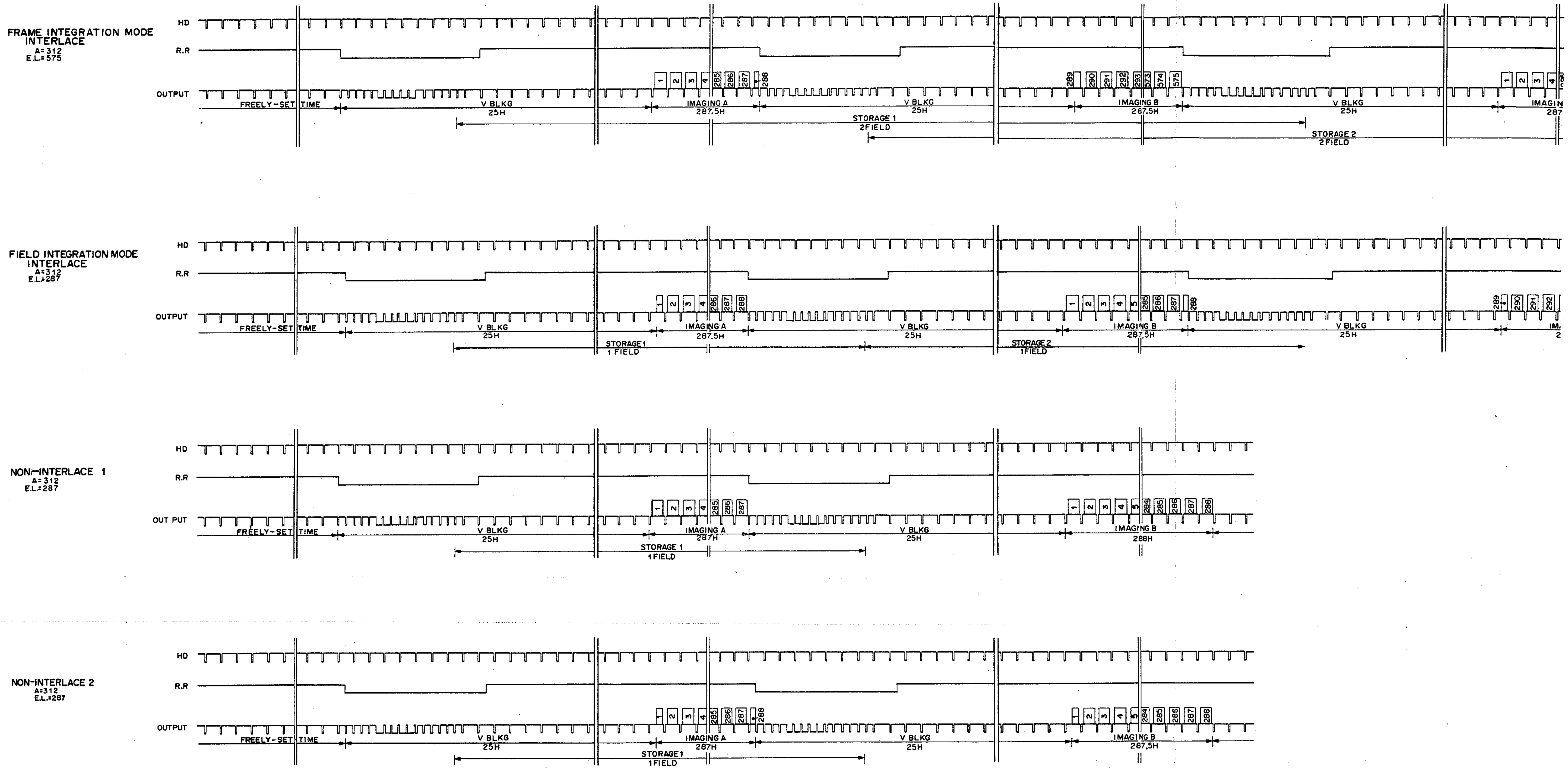
Read out mode
Scanning mode
Scanning
Storage time a VIDEO OUT co
Vertical effect (TV lines)
RESTART F
Features and application


V BLKG
25H
EVEN
312.5H
V BLKG
25H
ODD
312H
V BLKG
25H
EVEN
312H
NON-INTERLACE 1
NON-INTERLACE 2
1
2
3
4
5
6
283
284
285
286
287
288

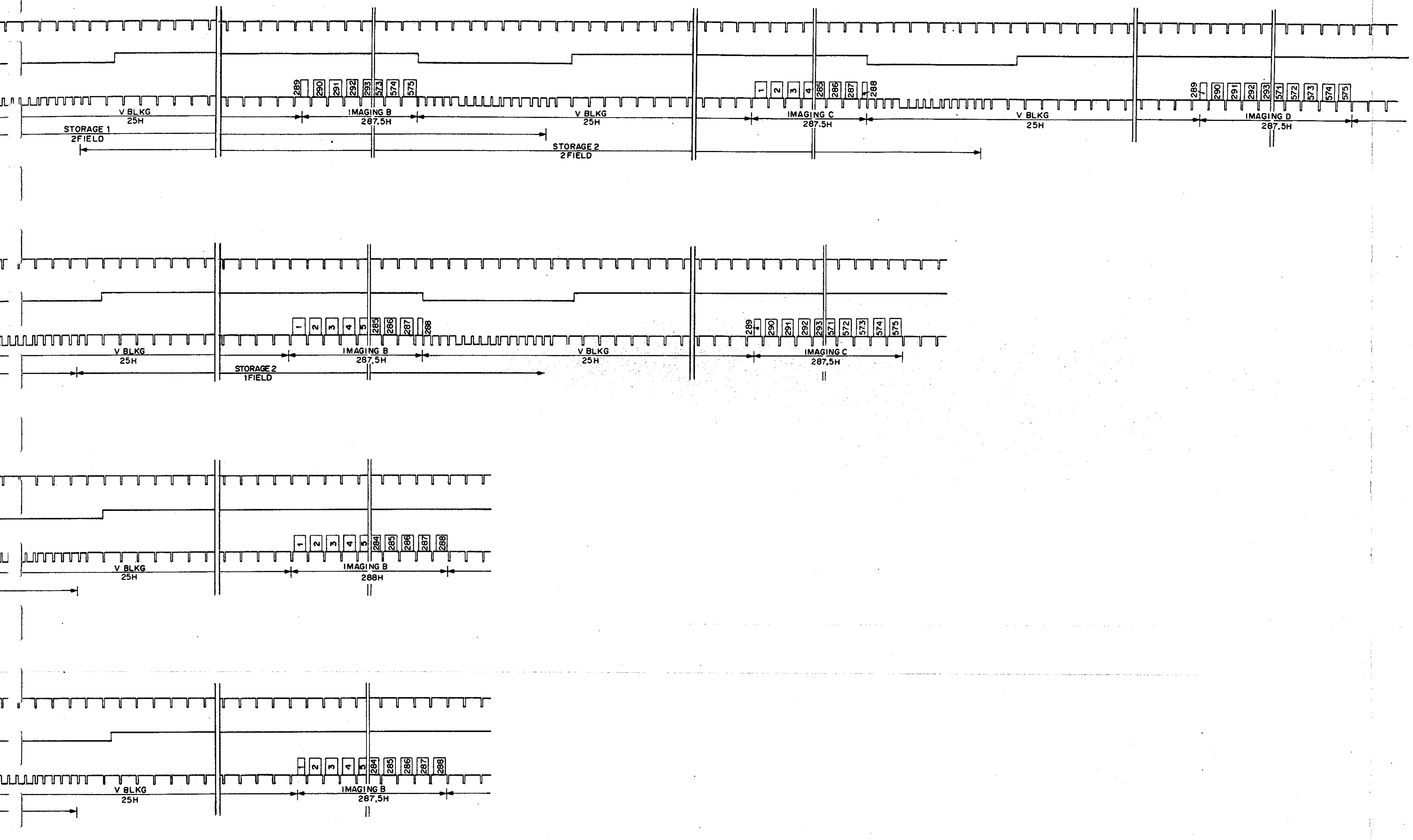
[Fig. 1]

Read out mode setting	Frame integration mode (initial setting)		Field integration mode	
Scanning mode	Interlace	Non-interlace	Interlace	Non-interlace
Scanning				
Storage time and VIDEO OUT correlation				
Vertical effective lines (TV lines)	575	287	415	287
RESTART RESET				
Features and application	As the highest possible resolution is obtained, it is adapted to the measurements of the frame memory.	Operates per 1 vertical line. Note: The operation is field integration mode.	Due to the storage of 1/50 seconds, a picture with even less disturbances than the frame integration mode is obtained. Adapted to pick up a moving object.	This system obtains all the vertical information without decreasing the sensitivity in non-interlace mode.

[Fig. 2] Relation between scanning mode and integration mode


FRAME INTEGRATION MODE
INTERLACE
A=312
E.L.=575
FIELD INTEGRATION MODE
INTERLACE
A=312
E.L.=287
NON-INTERLACE 1
A=312
E.L.=287
NON-INTERLACE 2
A=312
E.L.=287
HD
R.R
OUTPUT
OUT PUT
FREELY-SET TIME
V BLKG
25H
IMAGING A
287.5H
287H
IMAGING B
287.5H
288H
STORAGE 1
2FIELD
STORAGE 2
2FIELD
STORAGE1
1 FIELD
STORAGE2
1FIELD
1
2
3
4
5
284
285
286
287
288
289
290
291
292
293
573
574
575

[Fig. 3]


V BLKG
25H
STORAGE 1
2FIELD
IMAGING B
287.5H
V BLKG
25H
STORAGE 2
2FIELD
IMAGING C
287.5H
V BLKG
25H
IMAGING D
287.5H
V BLKG
25H
STORAGE 2
1FIELD
IMAGING B
287.5H
V BLKG
25H
IMAGING C
287.5H
V BLKG
25H
IMAGING B
288H
V BLKG
25H
IMAGING B
287.5H

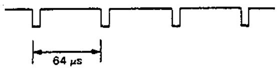
[Fig. 3]

2-3-3. RESTART RESET Mode

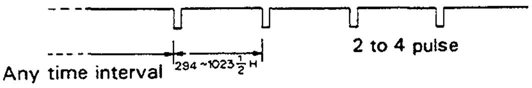
In the RESTART RESET (R.R) mode, information for one screen can be retrieved at any time. It is necessary to internally set the R.R mode in the camera to provide the R.R mode. *See Section* 2-4 "OPERATION MODE SETTING". Supply the HD and R.R signals to pin 6 and pin 7 of the 12-pin connector to obtain output.

- **Input conditions for the HD and R.R signals**

•Frequency (period)
HD signal: 15.625 KHz ± 1% (64 μs ± 1%)
Continuous pulse



R.R signal: 294 to 1023 1/2 H
2 to 4 pulses depending on the mode



•Phase
The same phase conditions as for the HD and VD mode are applied to this mode. See Section 2-3-2.

- **Explanation of the timing chart**

Figure 3 is the timing charts for each operation mode. The details of these timing charts are given below:

•Frame integration interlace mode
The R.R requires four pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 294 to 1023. It is 312 in the figure.
Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING C (ODD) and IMAGING D (EVEN). The CCD is reset in the intervals of IMAGING A and IMAGING B. Therefore, signals output during these intervals are meaningless.

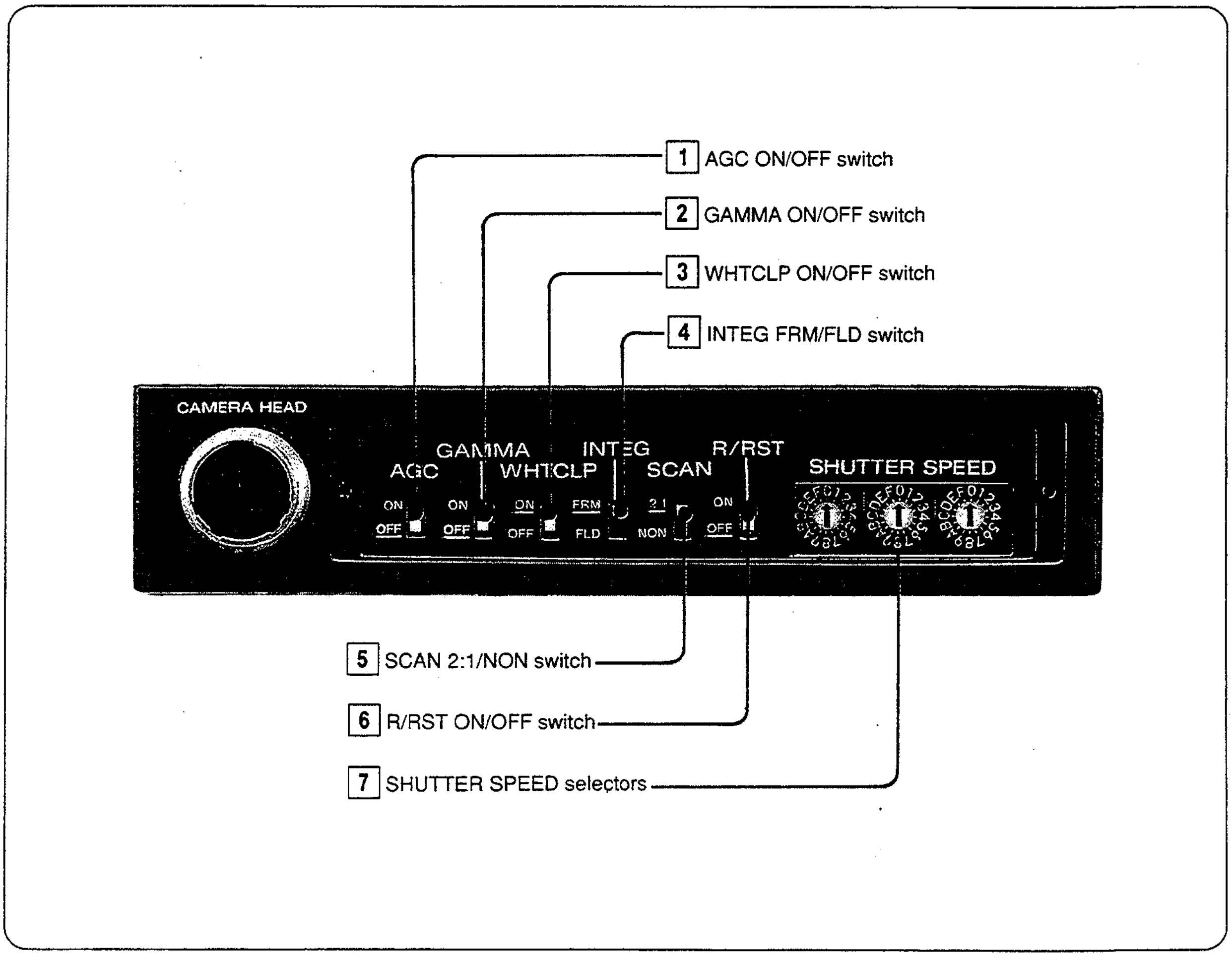
•Field integration interlace mode
The R.R requires three pulses. Set the period of the R.R to (A + 1/2) H. A is an integer, 294 to 1023. It is 312 in the figure.
Shooting information during STORAGE 1 and STORAGE 2 is output in the intervals of IMAGING B (ODD) and IMAGING C (EVEN). The CCD is reset in the interval of IMAGING A; therefore, signals output during this interval are irrelevant.

•Non-interlace mode
The R.R requires two pulses regardless of the storage mode. Set the period of the R.R to A H. A is an integer, 294 to 1023. It is 312 in the figure.
Shooting information in STORAGE 1 is output in the interval of IMAGING B. The CCD is reset in the interval of IMAGING A; therefore, signals output during this period are irrelevant.

2-4. MODE SETTING

The operation mode of XC-77RR-CE can be switched according to its application. The mode is set with the switches for PR-133 board, TG-58 board, and DR-96 board on the front panel and inside the camera control unit.

2-4-1. Setting the Mode On the Front Panel


1 AGC ON/OFF switch
2 GAMMA ON/OFF switch
3 WHTCLP ON/OFF switch
4 INTEG FRM/FLD switch
CAMERA HEAD
GAMMA
AGC
WHTCLP
INTEG
SCAN
R/RST
SHUTTER SPEED
ON
OFF
ON
OFF
ON
OFF
FRM
FLD
2:1
NON
ON
OFF
5 SCAN 2:1/NON switch
6 R/RST ON/OFF switch
7 SHUTTER SPEED selectors

1. AGC (Auto Gain Control) ON/OFF switch
This switch is used to set the gain of video output signal.
Set this switch to "ON" to activate AGC function.
Set this switch to "OFF" to fix the gain to 0 dB.
The switch is set to "OFF" at the factory.

2. GAMMA (Gamma Compensation) ON/OFF switch
This switch is used to set the gamma compensation of video output signals.
Set this switch to "ON" to output gamma compensated video signals.
Set this switch to "OFF" to output linear video signals without gamma compensation. This setting provides video signals proportional to the light from the object.
The switch is set to "OFF" at the factory.

3. WHTCLP (White Clip) ON/OFF switch
This switch is used to set the white clip level of video output signals.
Set this switch to "ON" to set the clip level to 110% ± 10%.
Set this switch to "OFF" to set the clip level to 140% ± 10%.
The switch is set to "ON" at the factory.

4. INTEG (Integration mode) FRM/FLD (Frame/Field) ON/OFF switch

This switch is used to set the cycle of reading the signal charge from the photosensor of CCD.
Set this switch to "FRM" for Frame Integration mode in which signal charge of every frame is read.
Set this switch to "FLD" for Field Integration mode in which signal charge of every field is read.
The switch is set to "FRM" at the factory.

NOTE In the Frame Integration mode, the sensitivity during non-interlace operation is one-half of that during interlace operation.

5. SCAN (Scanning mode) 2:1/NON (2:1 Interlace/Non-interlace) switch

This switch is used to set the scanning mode of video output signals.
Set this switch to "2:1" for the Interlace mode.
Set this switch to "NON" for the Non-interlace mode.
The switch is set to "2:1" at the factory.

NOTE This switch setting is effective when the unit is operating on internal synchronization signals. To operate the unit on external synchronization signals, set the switch to "2:1" regardless of the selection of Interlace or Non-interlace mode.

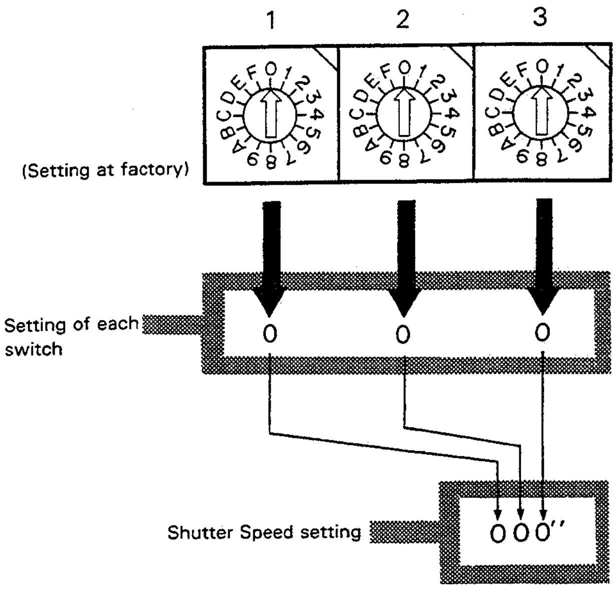
6. R/RST (Restart Reset) ON/OFF switch

This switch is used to set the external synchronization mode and ELECTRONIC SHUTTER mode.
Set this switch to "ON" when the ELECTRONIC SHUTTER function is off to select the Restart Reset mode. Set it to "ON" when the ELECTRONIC SHUTTER function is on to select the DONPISHA Shutter mode.
Set this switch to "OFF" to set the external synchronization mode to S/VS/VBS mode or HD, VD mode. Here, if the ELECTRONIC SHUTTER mode is on, the ELECTRONIC SHUTTER is set to the Normal Shutter mode.
The switch is set to "OFF" at the factory.

NOTE The ELECTRONIC SHUTTER function is turned on and off with the Shutter Speed switch. In the DONPISHA Shutter mode, external input reset pulse (trigger) is necessary (refer to "2-5. ELECTRONIC SHUTTER).
S/VS/VBS mode and HD, VD mode are switched automatically according to the input of synchronization signals. When synchronization signal is not input in these modes, the setting is automatically switched to the Internal Synchronization mode.
For details on the External Synchronization modes, refer to "2-3. EXTERNAL SYNCHRONIZATION."

7. SHUTTER SPEED switch

This switch is used to turn the ELECTRONIC SHUTTER function on and off and to set the shutter speed.
This Shutter Speed switch shows three hexadecimal digits.



Set the switch to "000" to turn off the ELECTRONIC SHUTTER function.
Set the switch to a combination other than "000" to turn on the ELECTRONIC SHUTTER function. The selected combination determines the shutter speed.
The switch is set to "000" at the factory.

NOTE Even with the same Shutter Speed setting, the shutter speed differs between DONPISHA Shutter mode and Normal Shutter mode.
For details on ELECTRONIC SHUTTER, refer to "2-5. ELECTRONIC SHUTTER."

2-4-2. Setting Modes In the Camera Control Unit

Six types of mode switches listed below can be found in the Camera Control unit.

1. Long Term Reset (L.T.R.) Shutter mode
2. Switch for terminating external synchronization signals with 75 ohms
3. Internal HD and VD Signal Output/External Synchronization Signal Input switch
4. Internal Clock Output/Internal VD Signal Output switch
5. Video Output Signal Sync ON/OFF switch
6. DONPISHA/L.T.R. Shutter External Synchronization mode

1. Long Term Reset Shutter mode

This mode is for setting the shutter speed externally.
This mode is selected by setting SW6 on the DR-96 board to "ON".
The mode is set to "OFF" at the factory.

NOTE To stabilize the video output signals, set the AGC ON/OFF switch on the front panel to "OFF", the INTEG FRM/FLD switch to "FLD", and the SCAN 2:1/NON switch to "2:1".
For details on the shutter mode, refer to "2-5. ELECTRONIC SHUTTER."

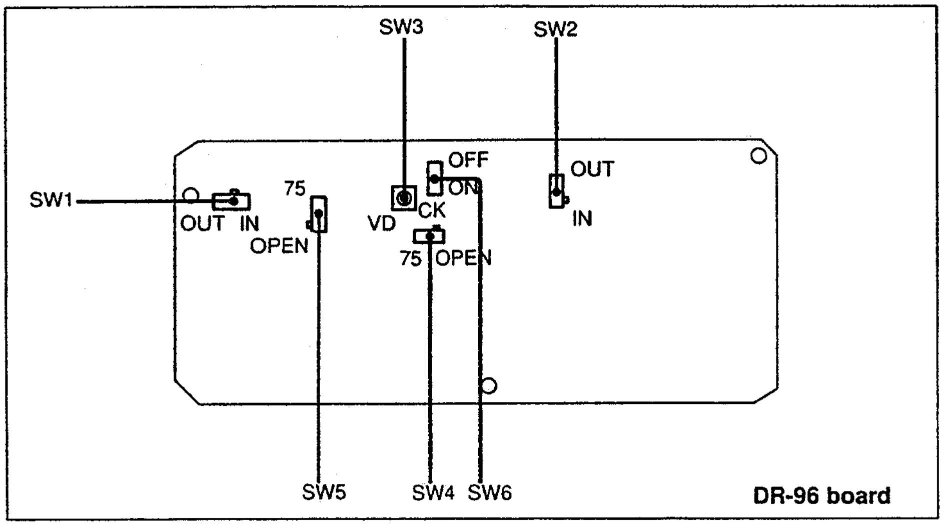
2. Switch for terminating external synchronization signals with 75 ohms

This switch is used to select whether or not to terminate external synchronization signals (S/VS/VBS signals and HD and VD signals) with 75 ohms.
S/VS/VBS signal or VD signal input side is set with SW5 on the DR-96 board.
HD signal input side is set with SW4 on the DR-96 board.
With either switch, select "75" to terminate the signal with 75 ohms and "OPEN" to not terminate the signal with 75 ohms.
Both switches are set to "OPEN" at the factory.

3. Internal HD and VD Signal Output/External Synchronization Signal Input switch

Reset this switch to output the synchronization signals (HD and VD) inside the camera module from the External Synchronization Signal Input Terminal.
Set SW1 on the DR-96 board to "OUT" to output internal VD signal.
Set SW2 on the DR-96 board to "OUT" to output internal HD signal.
Set both switches to "IN" to input external synchronization signals.
Both switches are set to "IN" at the factory.

NOTE Do not externally terminate the internal HD and VD signal outputs as they are TTL-level negative electrode pulses.

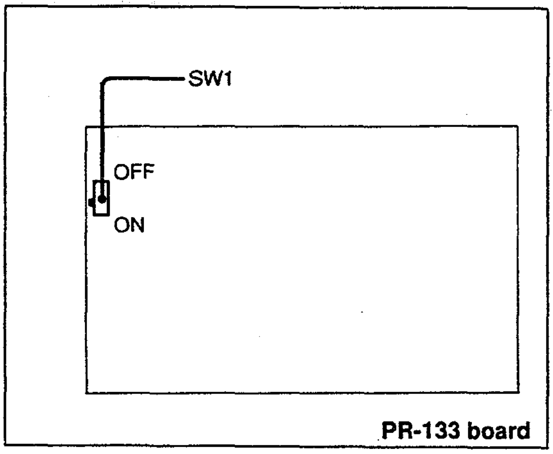


4. Clock Output/Internal VD Signal Output switch
   This switch is used to select internal clock (14 MHz) or internal VD signal to be output from pin 9 of the 12-pin connector.
   Select the output with SW3 on the DR-96 board.
   Set the switch to "CK" to output internal clock.
   Set the switch to "VD" to output internal VD signal.
   The switch is set to "VD" at the factory.

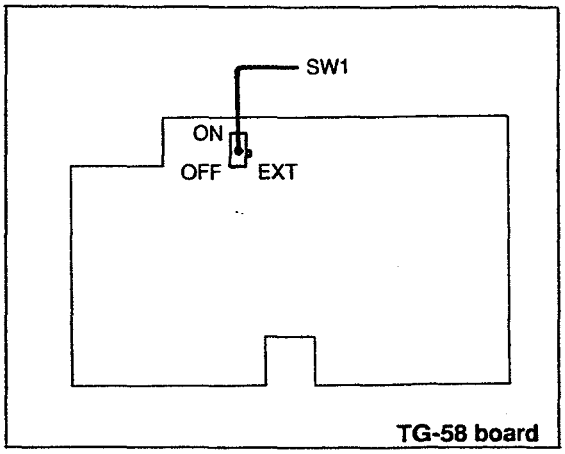
   NOTE Do not externally terminate the internal VD signal output as it is TTL-level negative electrode pulse.
   The output of this clock is 0.5 Vp-p upon termination with 75 ohm output.

5. Video Output Signal Sync ON/OFF switch
   SW1 on PR-133 board is used to select whether or not to add a sync signal to the video output signal.
   Set the switch to "ON" to add sync signal.
   Set the switch to "OFF" to not add sync signal.
   The switch is set to "ON" at the factory.

6. DONPISHA/L.T.R. Shutter HD Synchronization mode
   This mode is used to apply external synchronization to DONPISHA Shutter and L.T.R. Shutter for H by inputting HD signal from pin 6 of the 12-pin connector.
   Set SW1 on TG-58 board to "ON" to select this mode.
   Set the switch to "OFF" to return to normal mode.
   The switch is set to "OFF" at the factory.



PR-133 board



TG-58 board

2-5. ELECTRONIC SHUTTER

XC-77RR-CE has three primary Electronic Shutter modes:

1. Normal Shutter mode
2. DONPISHA Shutter mode
3. Long Term Reset Shutter mode

2-5-1. Normal Shutter Mode

The Normal Shutter refers to an ordinary electronic shutter. It is available in two modes: low speed and high speed. The speed mode is switched automatically when the Shutter Speed switch is set.

Shutter Speed Switch	Normal Shutter Mode	Shutter Speed
"001" to "11F"	Low speed	1/52.173 sec. to 1/1157.407 sec.
"120" to "B50"	High speed	1/1359.216 sec. to 1/2,364,583.333 sec.
"B51" to "FFF"	Unselective	

NOTE In the Normal Shutter mode, normal signals will not be output if the Shutter Speed switch is set between "B51" and "FFF."
The Normal Shutter is designed for use in the Field Integration mode. If the Normal Shutter is used in Frame Integration mode, the storage time of the EVEN field will be longer than that of the ODD field by 72 clock's worth (≒ 5.04 μsec.). Consequently, this difference in storage time appears on the output screen as a flicker. In addition, the sensitivity will be half of that of the Field Integration mode.

a. Low Speed mode

The shutter is set to the Low Speed mode when the Shutter Speed switch is set to "001" through "11F." For every incremental change made to the position of this switch, the shutter pulse is changed by 1 Hz increment. This process is illustrated in Fig. 1.

When the switch is set to "001," for example, the shutter pulses between the SG pulse and "1" are output. The storage time in this case is after the "1" pulse to the following SG pulse. In addition, Fig. 1 illustrates the status when the Shutter Speed switch is set to "015".

Furthermore, the signals integrated in "STORAGE A" are output at "IMAGE A," and the signals integrated in "STORAGE B" are output at "IMAGE B."

The relational expression between the Shutter Speed switch setting and shutter speed in the Low Speed mode is:

$$\text{Shutter speed (sec.)} = \frac{601 - 2\,[(\text{1's Setting}) \times 16^2 + (\text{2's setting}) \times 16 + (\text{3's setting})]}{31{,}250}$$

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

$$\text{Ans} = 300.5 - 15{,}265 \times S$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.001 sec. (1/1000 sec.) is:

$$\text{Ans} = 300.5 - 15{,}625 \times 0.001 = 284.875 \fallingdotseq 285$$

Converting this 285 into a hexadecimal value, we arrive at "11D."
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "11D."

b. High Speed mode

The shutter speed is set to High Speed mode when the Shutter Speed switch is set to "120" through "B50." For each incremental change made to the position of the switch, the shutter pulse duration in V BLK is changed by 280 nsec increment. This process is illustrated in Fig. 2.
The storage period in this mode is from the last transition of "broad pulse" to SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in "STORAGE B" are output at "IMAGE B."

The relational expression between the Shutter Speed switch setting and shutter speed in the High Speed mode is:

Shutter speed (sec.)

$$= \frac{2897.5\ [(1\text{'s setting}) \times 16^2 + (2\text{'s setting}) \times 16 + (3\text{'s setting})]}{3{,}546{,}875}$$

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

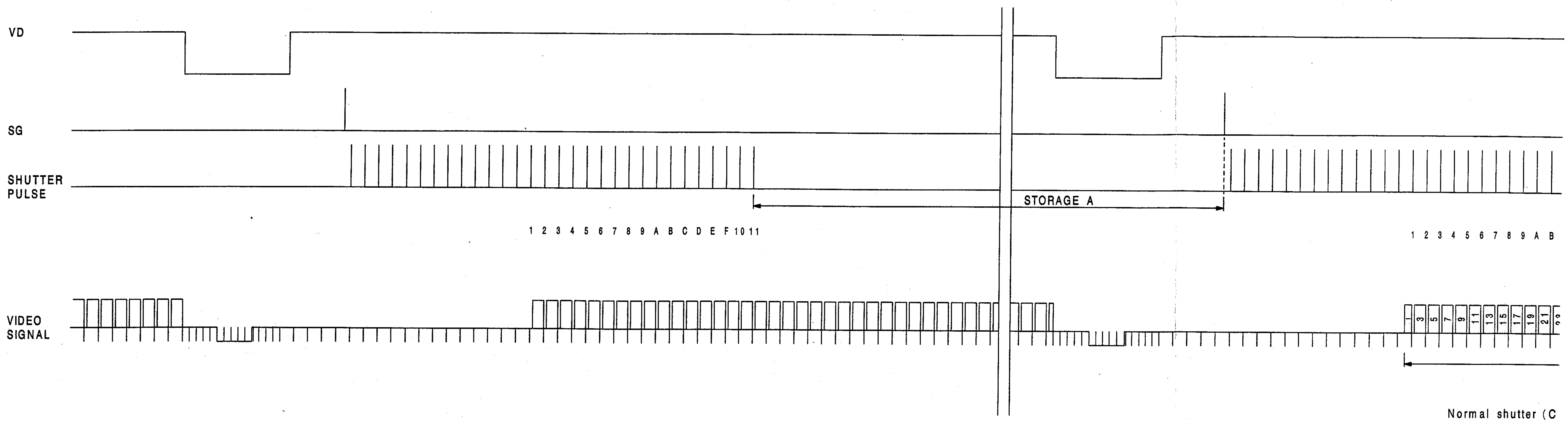
$$\text{Ans} = 2897.5 - 3{,}546{,}875 \times S$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.0001 sec. (1/10,000 sec.) is:

$$\text{Ans} = 2897.5 - 3{,}546{,}875 \times 0.0001 = 2542.8125 \fallingdotseq 2543$$

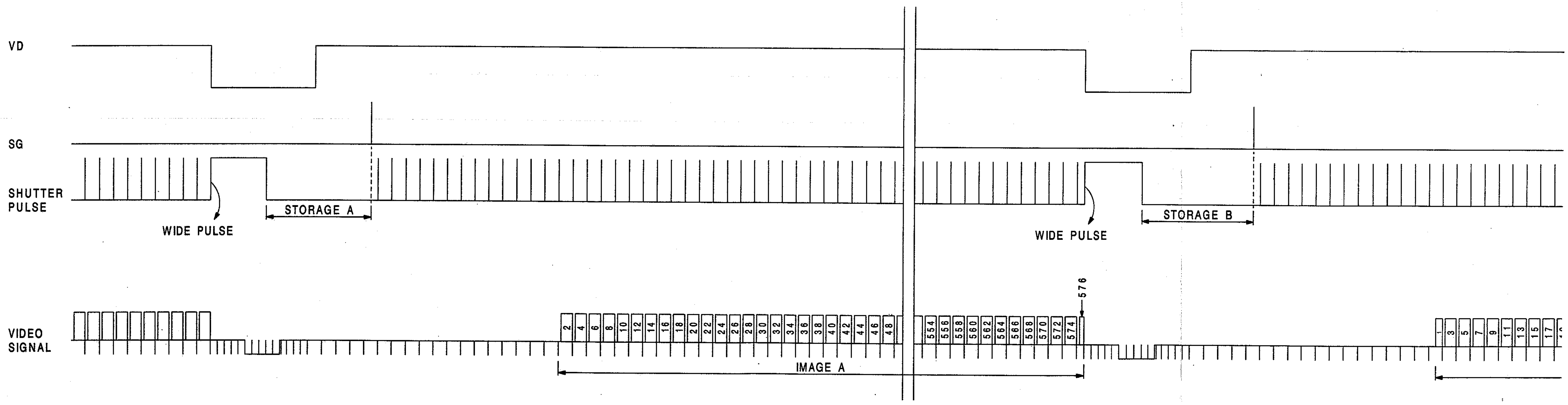
Converting this 2543 into a hexadecimal value, we arrive at "9EF".
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "9EF".


VD
SG
SHUTTER PULSE
STORAGE A
1 2 3 4 5 6 7 8 9 A B C D E F 10 11
1 2 3 4 5 6 7 8 9 A B
VIDEO SIGNAL
1
3
5
7
9
11
13
15
17
19
21

Normal shutter (C

Low Speed moc

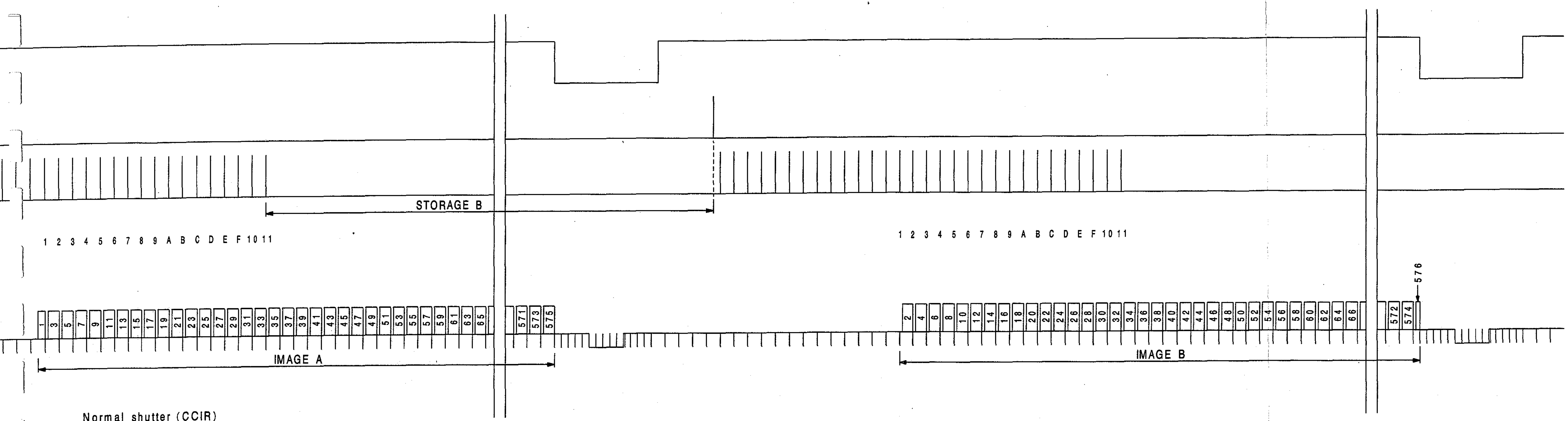
Fig.1


VD
SG
SHUTTER PULSE
WIDE PULSE
STORAGE A
WIDE PULSE
STORAGE B
VIDEO SIGNAL
576
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
554
556
558
560
562
564
566
568
570
572
574
IMAGE A
1
3
5
7
9
11
13
15
17

Normal Shutter (C

High Speed mo

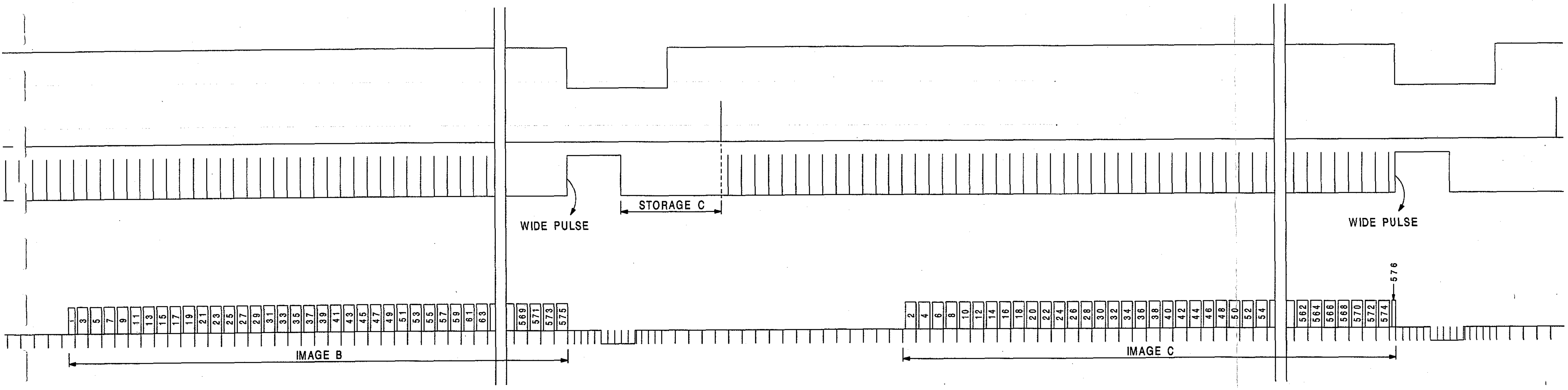
Fig.2


STORAGE B
1 2 3 4 5 6 7 8 9 A B C D E F 10 11
1 2 3 4 5 6 7 8 9 A B C D E F 10 11
576
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65
571 573 575
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66
572 574
IMAGE A
IMAGE B

Normal shutter (CCIR)

Low Speed mode

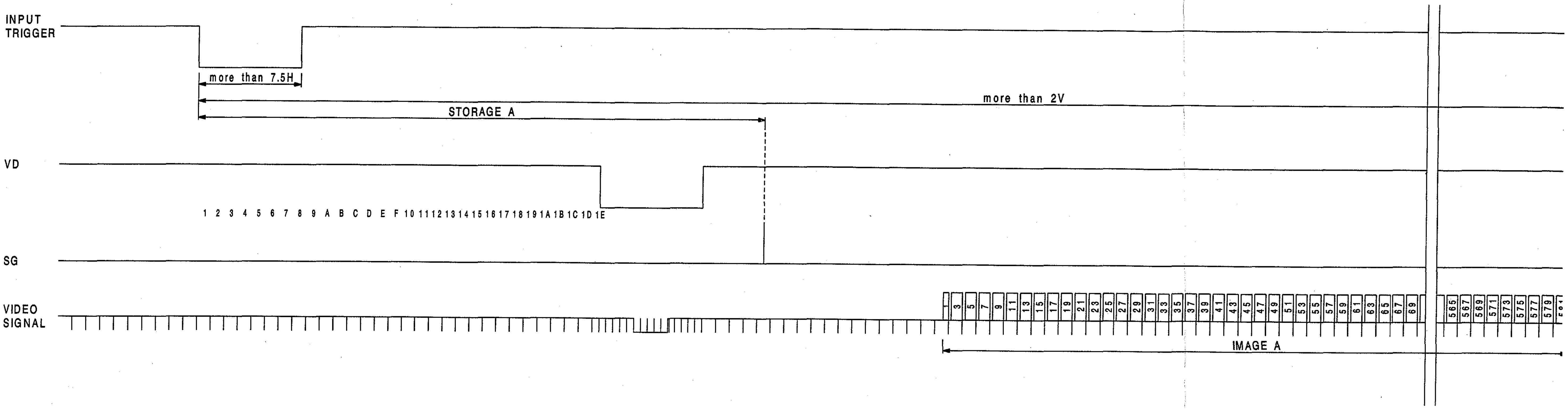
Fig.1


WIDE PULSE
STORAGE C
WIDE PULSE
576
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63
569 571 573 575
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54
562 564 566 568 570 572 574
IMAGE B
IMAGE C

Normal Shutter (CCIR)

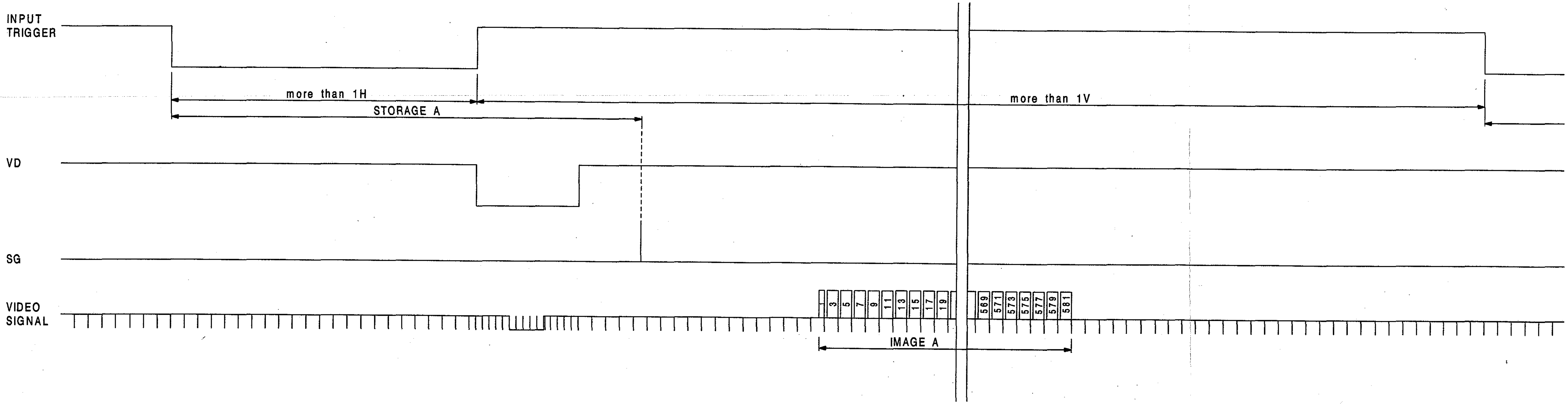
High Speed mode

Fig.2


INPUT TRIGGER
more than 7.5H
more than 2V
STORAGE A
VD
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E
SG
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69
565 567 569 571 573 575 577 579
IMAGE A

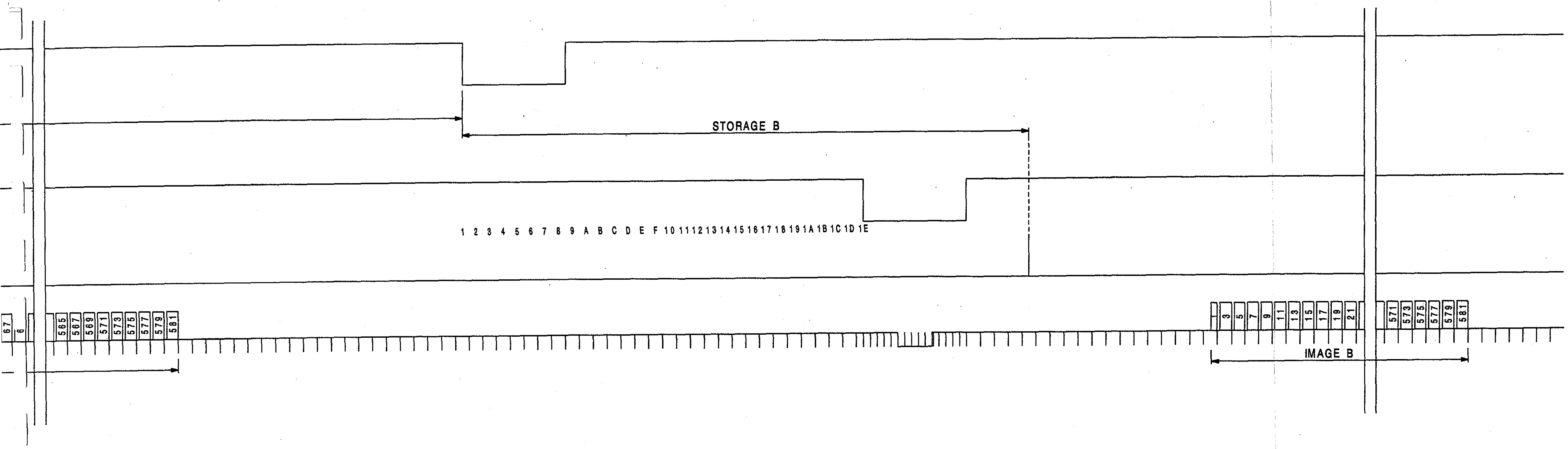
Donpisha Shutter mode (CC

Fig.3


INPUT TRIGGER
more than 1H
STORAGE A
more than 1V
VD
SG
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19
569 571 573 575 577 579 581
IMAGE A

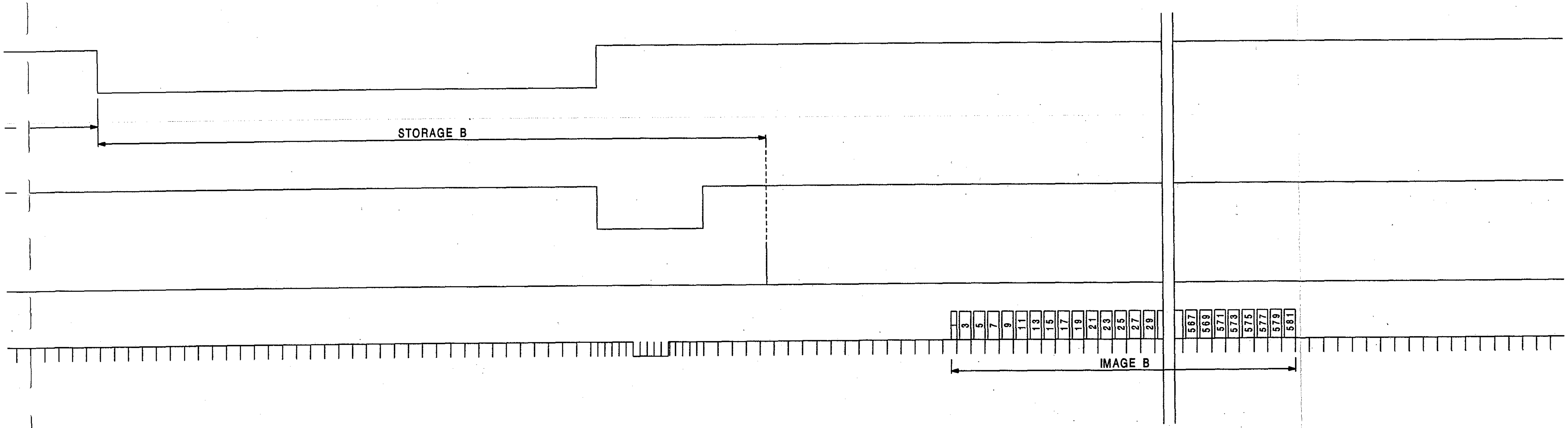
Long Term Shutter mode (CC

Fig.4


STORAGE B
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E
67
6
565
567
569
571
573
575
577
579
581
3
5
7
9
11
13
15
17
19
21
571
573
575
577
579
581
IMAGE B

D pisha Shutter mode (CCIR)

Fig.3


STORAGE B
3
5
7
9
11
13
15
17
19
21
23
25
27
29
567
569
571
573
575
577
579
581
IMAGE B

ong Term Shutter mode (CCIR)

Fig.4

2-5-2. DONPISHA Shutter Mode

In this shutter mode, the electronic shutter begins storage when an external trigger pulse is received. The trigger is input from pin 7 of the 12-pin connector.
Storage is begun approximately 1 sec after the last transition of the trigger input pulse and is performed until SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in "STORAGE B" are output at "IMAGE B."

For every incremental change made to the position of the Shutter Speed switch, the storage time is changed by 1H increment. This process is illustrated in Fig. 3.

When the switch is set to "001," for example, internal VD is output at the timing of "1" after the trigger is input. When the switch is set to "002," the VD is output at the timing of "2".
Fig. 3 illustrates the condition when the Shutter Speed switch is set to "029".
The recommended duration of trigger pulse to input is 7.5H through 25H. Furthermore, the required input gap is "2 fields" or more when the Shutter Speed switch is set to "001" through "12E," and "shutter speed + 1 field" or more when it is set to "12F" through "FFF".

The relational expression between the Shutter Speed switch and shutter speed in the DONPISHA mode is:

Shutter speed (sec.)

$$= \frac{10{,}149 + 908\ [(1\text{'s setting}) \times 16^2 + (2\text{'s setting}) \times (3\text{'s setting})]}{14{,}187{,}500}$$

From the equation above, the range of shutter speed is 1/1283.124 (sec.) to 1/3.805 (sec.).

On the other hand, to derive the switch setting from the desired shutter speed, use the following equation to calculate Ans:

When "S" is given as the shutter speed;

$$\text{Ans} = \frac{14{,}187{,}500 \times S - 10{,}149}{908}$$

Take the integer closest to the value of Ans and convert it into a hexadecimal value for the switch setting closest to the desired shutter speed.
To convert decimal integers into hexadecimal integers, use the conversion table of Section-D.

<Example> The setting for shutter speed of 0.002 sec. (1/500 sec.) is:

$$\text{Ans} = \frac{14{,}187{,}500 \times 0.002 - 10{,}149}{908} = 20.07 \fallingdotseq 20$$

Converting this 20 into a hexadecimal value, we arrive at "014."
Thus, the shutter speed closest to the desired shutter speed can be obtained by setting the Shutter Speed switch to "014."

NOTE In the DONPISHA Shutter mode, only one field (even field) is output for one trigger.
In addition, the DONPISHA Shutter is designed for use in the Field Integration mode if the DONPISHA Shutter is used in the Frame Integration mode, the storage time of the EVEN field will be longer than that of the ODD field by 72 clock's worth ($\fallingdotseq$ 5.04 μsec.). The shutter speed set with the switch is reduced by the time length shwon above.
In addition, the sensitivity will be half of that of the Field Integration mode.

2-5-3. Long Term Reset Shutter

Unlike the other two shutter modes, the storage time can be set externally in this Electronic Shutter mode. The storage time is determined by the duration of Low level of the trigger pulse input from the outside. In essence, the storage time is lengthened in proportion to the increase in Low level duration. This concept is illustrated in Fig. 4.

The storage time in this mode is from the last transition of the trigger to the SG pulse.
In addition, the signals integrated in "STORAGE A" are output at "IMAGE A" and the signals integrated in STORAGE B" are output at "IMAGE B."

The storage time in the Long Term Reset Shutter mode can be expressed with the following equation:

$$\text{Storage time (sec.)} = \frac{11{,}057}{14{,}187{,}500} + \text{(Pulse duration)}$$

NOTE Input the trigger in this mode at TTL level.

SECTION 3

THEORY OF OPERATION

3-1. OPERATION PRINCIPLE OF THE CCD

A CCD (Charge Coupled Device) consists of MOS (Metal-Oxide-Semiconductor) capacitors arranged in a regular array.
It basically performs three functions connected with handling charges.

1. Photoelectric conversion (photosensor)
Incident light generates charges on the MOS capacitors, with the quantity of charge being proportional to the brightness.

2. Accumulation of charges
When a voltage is applied to the electrodes of the MOS capacitors, an electric potential well is formed in the silicon layer. The charge is accumulated in this well.

3. Transmission of charge
When a high voltage is applied to the electrodes, a deeper well is formed; when a low voltage is applied, a shallower well is formed, In the CCD, this property is used to transmit the charge. When a high voltage is applied to the electrodes, a deep electric potential well is formed, and charge flows in from neighboring well. When this is repeated over and over among the regularly arranged electrodes, the charge is transferred from ones MOS capacitor to another. This is the principle of CCD charge transmission.

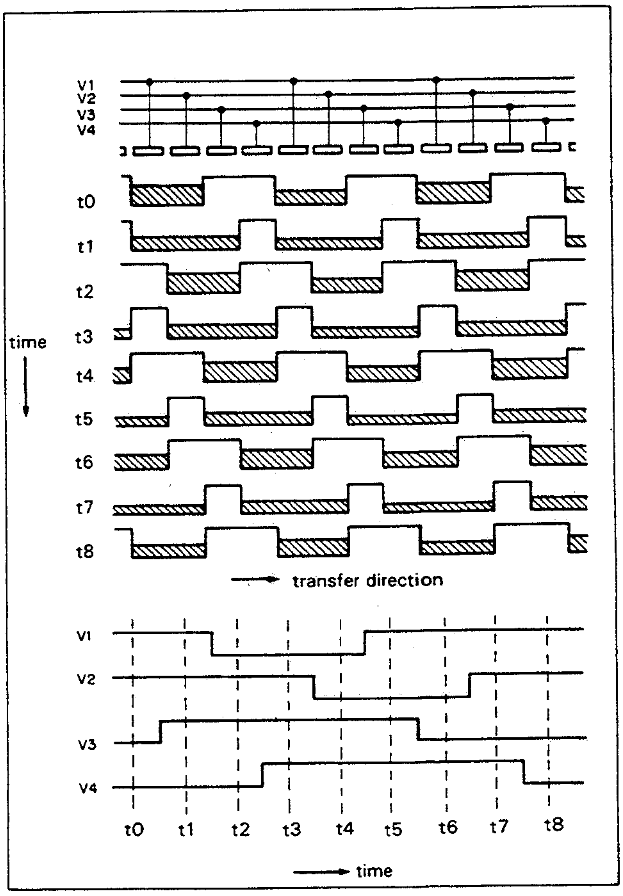
3-2. MECHANISM OF CCD CHARGE TRANSFER

The interline transfer system employed by the XC-77RR-CE transfers the charges proportional to the brightness of the image produced on the CCD sequentially as shown in Figure 3 on page 3-2. The charge proportional to the brightness of the object is detected by the photo sensor, and transfered to the neighboring vertical shift register. Then this charge is transfered to the horizontal shift register in vertical sequence. Then it is output through the output section in horizontal sequence.

1. Vertical transfer
The vertical shift register transfers charges using a four-phase drive mode. Figure 1 shows an example of the changes which can occur in potential wells in successive time intervals.
At t0, the electrode voltages are (V1 = V2) > (V3 = V4), so the potential wells are deeper toward the electrode at the higher voltages V1 and V2. Charges accumulate in these deep wells.
At t1, the electrode voltages are (V1 = V2 = V3) > (V4), so the charges accumulate in the wells toward the electrode at V1, V2 and V3.
At t2, the electrode voltages are (V2 = V3) > (V4 = V1), so the charges accumulate in the wells toward the electrode at V2 and V3.
Electrode voltage states at t3 and after are shown below.

t3 (V2 = V3 = V4) > (V1)
t4 (V3 = V4) > (V1 = V2)
t5 (V4) > (V1 = V2 = V3)
t6 (V4 = V1) > (V2 = V3)
t7 (V4 = V1 = V2) > (V3)
t8 (V1 = V2) > (V3 = V4) (Initial state)

These operations are repeated to execute the vertical transfer.



[Fig.1] Vertical transfer

2. Horizontal transfer

The horizontal shift register transfers charges using a two-phase drive mode. Figure 2 shows an example of the changes which can occur in the potential wells in successive time intervals.

At t1, the electrode voltages are H1 > H2, so the potential wells are deeper toward the electrode of the higher voltage H1. The charges accumulate in these wells.

At t2, the electrode voltages H1 and H2 are inverted, the wells toward the electrode at voltage H2 becomes deeper while the wells toward the electrode at voltage H1 become shallower. So the wells at H2 are deeper than those at H1, the charge flows into the deeper wells toward the electrode at H2.

At t3, the electrode voltage have not changed since t2, so the charge flows into the wells at H2 and one transfer of charge is completed. These operations are repeated to execute the horizontal transfer.

3-3. PA-93 BOARD

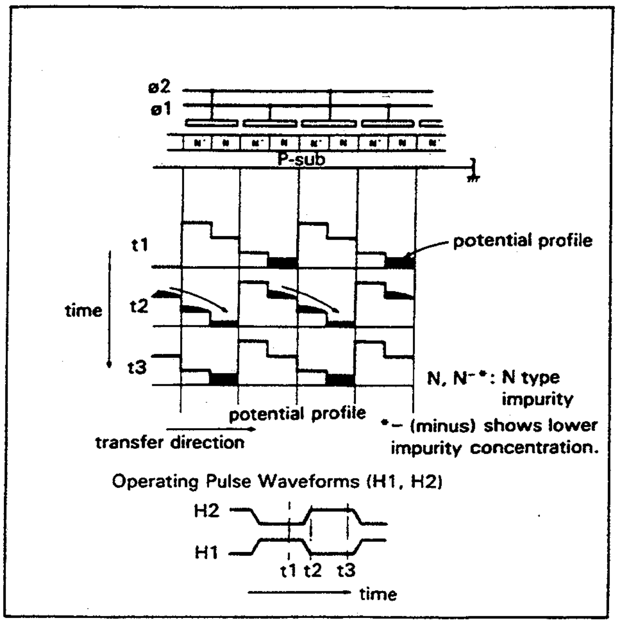
Light coming through the camera lens strikes the CCD chip surface of IC1 on the PA-93 board.

The surface of the CCD contains a number of photosensors. The array is 816 horizontal photosensors by 606 vertical photosensors, for a total of 494,496. Of these, the effective number is 756 horizontal photosensors by 581 vertical photosensors, or a total of 439,236. The incident light is converted by the photosensors into an electric charge proportional to the brightness of each color.

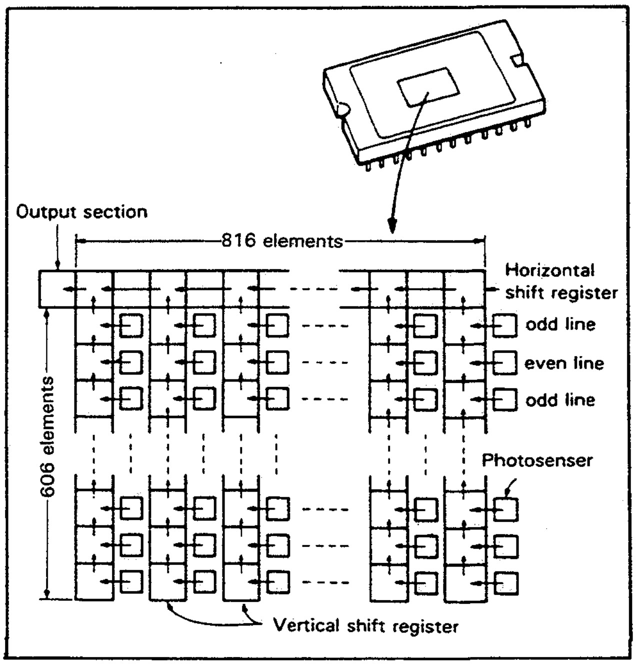
The converted electric charge is read from the photosensor by a register and is transferred in sequence and fed to the output section.

The register is subdivided into horizontal and vertical shift registers. As shown in Fig. 3, there are 816 vertical rows of registers, while there is only one horizontal row of registers in each, across the top. Each converted electric charge is transferred by field (frequency of VD) to the vertical shift register adjoining each photosensor. The electric charge is then vertically transferred in sequence at the vertical transfer clock V1, V2, V3, and V4 (frequency of HD; f_H) to the horizontal register. The horizontal registers transfer the charges horizontally at the horizontal transfer clock H1, H2, 908 f_H, to the output section.

The output from IC1 is output after the capacitor at the output section converts the electric charge into a voltage signal. The output is then sent to the CCU from the 75-ohm driver (Q10 to Q15) after passing it through the buffer (Q8, Q9). Q1 to Q3 are PG pulse drivers which reset the electric charge read by one picture element. Q4 to Q7 are shutter pulse drivers. The shutter pulse input is sent to the SUB input of IC1 by modulating the V SUB after driving.


ø2
ø1
N⁻
N
P-sub
t1
t2
t3
time
potential profile
potential profile
transfer direction
N, N⁻*: N type impurity
*– (minus) shows lower impurity concentration.
Operating Pulse Waveforms (H1, H2)
H2
H1
t1 t2 t3
time

[Fig.2] Horizontal transfer

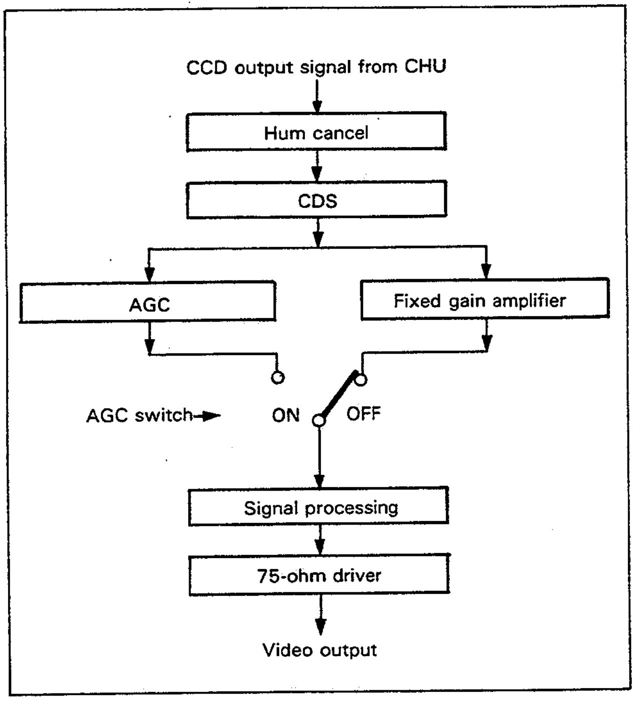

Output section
816 elements
Horizontal shift register
odd line
even line
odd line
606 elements
Photosenser
Vertical shift register

[Fig.3] The interline-transfer organization of the CCD image sensors

3-4. PR-133 BOARD

The PR-133 board converts the CCD output signal from the CHU into an image signal which the board processes and then outputs as a video signal.
This board mainly contains the following six blocks.

1. Hum cancel
2. CDS
3. AGC
4. Fixed gain amplifier
5. Signal processing
6. 75-ohm driver



[Fig. 4] PR-133 board concept

1. Hum cancel
This is a differential amplifier circuit which consists of Q1, Q2, and Q3.
The CCD output signal from the PA-93 board of CHU picks up hum elements while passing through the cable to the CCU. The hum cancel circuit eliminates these hum elements.
The gain of this hum cancel circuit is times 1.1.

2. Co-delayed double sampling (CDS)
The sample and hold circuit of the CDS eliminates a noise element peculiar to the CCD output signal. After the hum elements are eliminated by the hum cancel circuit, the CDS process divides the signal into two signals, and performs sample and hold for each signal. For one of these signals, sample and hold is performed twice, which includes sample and hold for the SHP pulse (Q4 to Q6) and the SHD pulse (Q7 to Q9). For the other signal, sample and hold is performed for only the SHP pulse (Q10 to Q12). The difference obtained between the two signals passed through sample and hold in these two routes is used as the image signal. This image signal is retrieved by differential amplifiers (Q13 to Q15).

3. Automatic gain control (AGC)
AGC is performed in IC1. The function of the AGC circuit stabilizes the output regardless of the IC operations. The gain is determined by the DC value at the gain control input (pin 6) of IC1. This DC value is produced from the image signal in detection circuits (Q23 to Q26).
The maximum gain is set by RV2, and the minimum gain is set by RV18.

4. Fixed gain amplifier
Fixed gain amplifier is a differential amplifier which consists of Q16, Q17, and Q18.
Fine adjustment of the gain is performed at RV1.

5. Signal processing
Either the AGC output or the fixed gain amplifier output is sent to the filter (FL1) after analog switching (Q19 to Q22, Q43). This switching is determined according to the setting of the switch on the front panel.
The signal that passes through the filter is sent to IC2. It is then output to the 75-ohm driver after signal processing such as clamping, gamma correction, blanking, setup addition, SYNC signal mixing, and white clipping have been performed.
The functions of the adjustment resistances in the signal processing block are explained below.

RV4 : Setup adjustment
(gamma correction OFF)
RV5 : SYNC level adjustment
(gamma correction OFF)
RV7 : Gamma correction adjustment
(gamma correction ON)
RV8 : White clipping adjustment
(gamma correction OFF, white clip ON)
RV9 : White clipping adjustment
(gamma correction OFF, white clip OFF)
RV11: White clipping adjustment
(gamma correction ON, white clip OFF)
RV12: White clipping adjustment
(gamma correction ON, white clip ON)
RV16: Setup adjustment
(gamma correction ON)
RV17: SYNC level adjustment
(gamma correction ON)

6. 75-ohm driver
The image signal processed in IC2 is output from CN5 as video signal via 75-ohm driver (Q27 to Q33).

3-5. TG-58 BOARD

The TG-58 board contains a synchronization signal generator circuit, a clock oscillation circuit for driving the CCD, and a shutter pulse generator circuit.
When there is an external synchronization signal, the VCO starts operating and outputs a clock which is synchronized with the external synchronization signal. When TP5 is +2.8V, the VCO outputs a clock of 28.375MHz (1816 f_H). Fine adjustment is performed by CV1.
When there is an internal synchronization signal, a clock of the frequency indicated above is output using the quartz oscillator.

CLOCK:	908 f_H clock.
HD, VD:	Horizontal and vertical synchronization signals.
XH1, XH2:	2-phase clock for driving horizontal shift register and transferring electric charge.
XV1 to XV4:	4-phase clock for driving vertical shift register and transferring electric charge.
XPG:	Precharge gate control pulse. Precharge gate is a gate for the horizontal shift register and output section. By controlling this gate, the transferred electric charge is converted into an electrical signal (voltage).

The above are output to the DR-96 board.

BLKG:	Blanking signal.
SYNC:	Composite SYNC signal.
CLP1:	Clamping pulse for the optical black level of CCD output signal.

The above are output to the PR-133 board.

X SHUTTER: Shutter pulse signal.
The X SHUTTER is output to the PA-93 board via the SW-367 board.

3-6. DR-96 BOARD

The DR-96 board mainly contains the following five blocks.

1. External synchronization signal waveform shaping block
2. DC-DC converter and +9.5V power supply block
3. CCD drive clock driver
4. CCD substrate power supply block
5. 14MHz clock output driver

1. External synchronization signal waveform shaping block
This block consists of Q3 to Q5, IC6, and IC7.
When the VS signal or VBS signal is input as the external synchronization signal, the SYNC component in the signal is separated and output after the SYNC signal is waveshaped into a SYNC pulse of 5Vp-p. With HD or VD signals, it is output as a pulse of 5Vp-p regardless of the input level.

2. DC-DC converter and +9.5V power supply block
This block consists of PU1, IC1, and Q1.
The DC-DC converter (PU1) performs respective voltage outputs after converting the current from the external power supply (+12V) into voltages of +25V, +15V, +7V, +5V, and −7V. In addition to these voltages, the regulator circuit consisting of IC1 and Q1 generates +9.5V from the +12V.

3. CCD drive clock driver
This circuit drives each CCD drive clock (XH1, XH2, XV1 to XV4, XPG) sent from the TG-58 board and outputs them to the PA-93 board of the CHU via the SW-367 board.
XH1 and XH2 are inverted at the H clock driver (XH1: IC3, XH2: IC2) and output as H1 and H2.
XV1 to XV4 are inverted at the V clock driver (IC5) and output as V1 to V4.
XPG is output from the cable driver (IC4, Q6 to Q9) without being inverted. (The PG driver on the PA-93 board of CHU is used as the cable driver.)

4. CCD substrate power supply block

The power supply (V SUB) for the CCD substrates are of specific values (+9V to +19V) for each CCD. This value must be set in accordance with the value indicated on the top surface of DC-DC converter. Moreover, when a CCD is replaced, adjust the value in accordance with the new value (the new value is indicated in symbols on the rear of the CCD. See SECTION 4 for instructions on how to read the symbols.)

The block consists of Q15 and Q16, and the value of TP3 will be the voltage setting. Use RV2 for adjustments.

5. 14MHz clock output driver

This driver outputs a clock of 908 f_H to the outside from the camera module. The driver consists of IC4 and Q10 to Q12. It can output a clock above 500mVp-p at 75-ohm termination.

3-7. SW-367 BOARD

The SW-367 board contains the following seven switches and 20-pin connector which connects the CHU and each signal.

SW1: AGC switch
SW2: Gamma correction switch
SW3: White clipping switch
SW4: Integration mode switch
SW5: Scanning mode switch
SW7: Restart reset switch
SW8 to SW10: Shutter speed setting switch

Each CCD driving pulse and shutter pulse, and each power supply is output to the CHU.

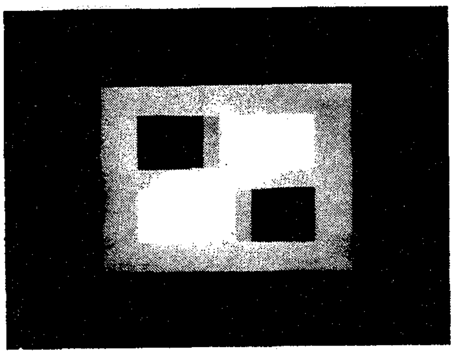
CCD output signal is input from the CHU.

SECTION 4
ALIGNMENT

4-1. FIXTURES AND EQUIPMENTS

- Oscilloscope
- Waveform monitor
- B/W monitor
- Digital voltmeter
- Power supply equipment: Junction box JB-77 (sold on the market) and regulated power supply unit, or camera adaptor DC-77RR-CE (sold on the market)
- Camera cable: CCXC-12P02/05/10/20 (sold on the market)
- Extension cable: CCXC-20P25 (sold on the market)
- Tripod attachment: VCT-77RR (sold on the market)
- Lens: Standard VCL-16Y-M (sold on the market)
- Pattern box: PTB-500
  (SONY part No.: J-6029-140-A)

- Grayscale chart
  (SONY part No.: J-6026-130-B)

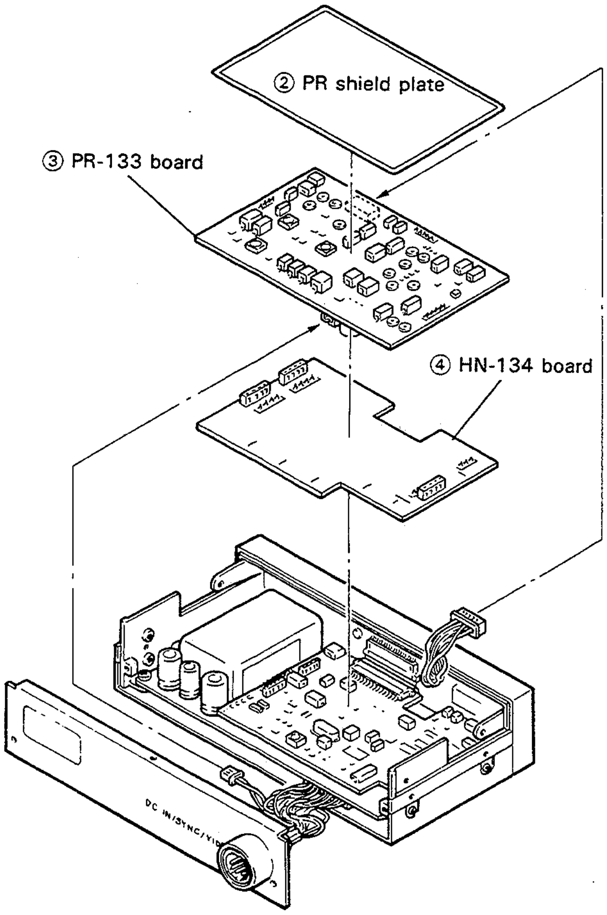


[If the pattern box is unavailable]
- 100-W bulb
- Variable voltage transformer

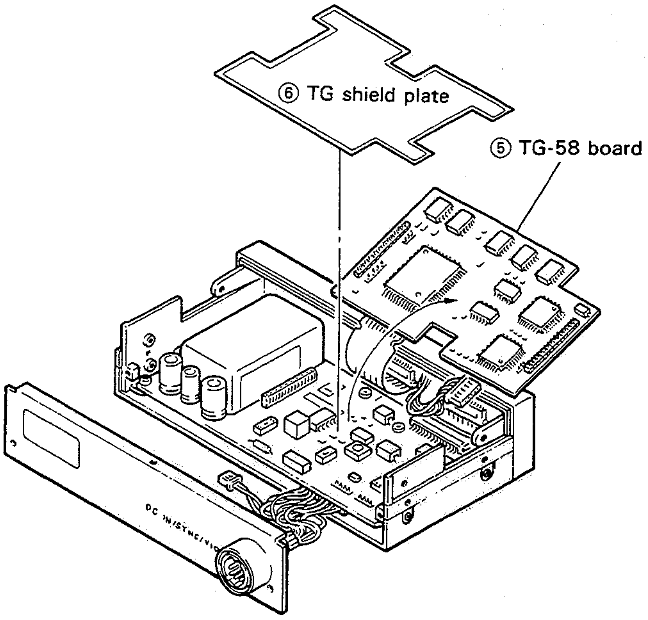
4-2. ADJUSTMENT OF DR-96 BOARD

4-2-1. Preparation

① Remove the upper case and rear panel by referring to "How to open the panel" section on page 1-19 (E).
② Remove the shield plate PR.
③ Remove the PR-133 board then remove the CN4 and CN5.
④ Remove the HN-134 board.


② PR shield plate
③ PR-133 board
④ HN-134 board
DC IN/SYNC/VI

⑤ Remove the TG-58 board as shown in the illustration.
⑥ Remove the shield plate TG.


⑥ TG shield plate
⑤ TG-58 board
DC IN/SYNC/VI

⑦ Connect the connectors (DC IN/SYNC/VIDEO) to the camera adoptor DC-77RR-CE or the junction box JB-77 using the camera cable, and supply the power (refer to the Connections 4-3-2).

NOTE

Do not connect the camera head unit.

4-2-2. +9.5V Voltage Adjustment

Equipment: Digital voltmeter
Test point: TP2 (GND: TP1)
Adj. point: ⊘RV1
Spec.: +9.5V ± 0.2V

4-2-3. CCD Substratum Voltage Adjustment

Equipment: Digital voltmeter
Test point: TP3 (GND: TP1)
Adj. point: ⊘RV2
Spec.: Establishment value

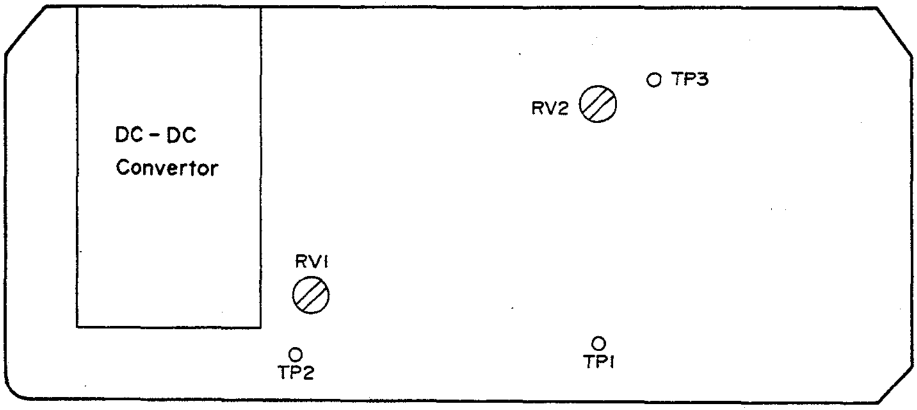
- Establishment value
  When the CCD image device is not replaced, the value is indicated on side of DC-DC converter.
  If the CCD is replaced, a substratum voltage setting volue is indicated in a 2-digit code on the rear of the new CCD.

2 digit-code display: □ □ ← Decimal
↑ Integral

The code integrals and the real value correspond with each other as follows:

Code integral	9	A	B	C	D	E	F	G	H	I	J
Value	9	10	11	12	13	14	15	16	17	18	19

<Example> F5 → 15.5 (V)



DR-96 board

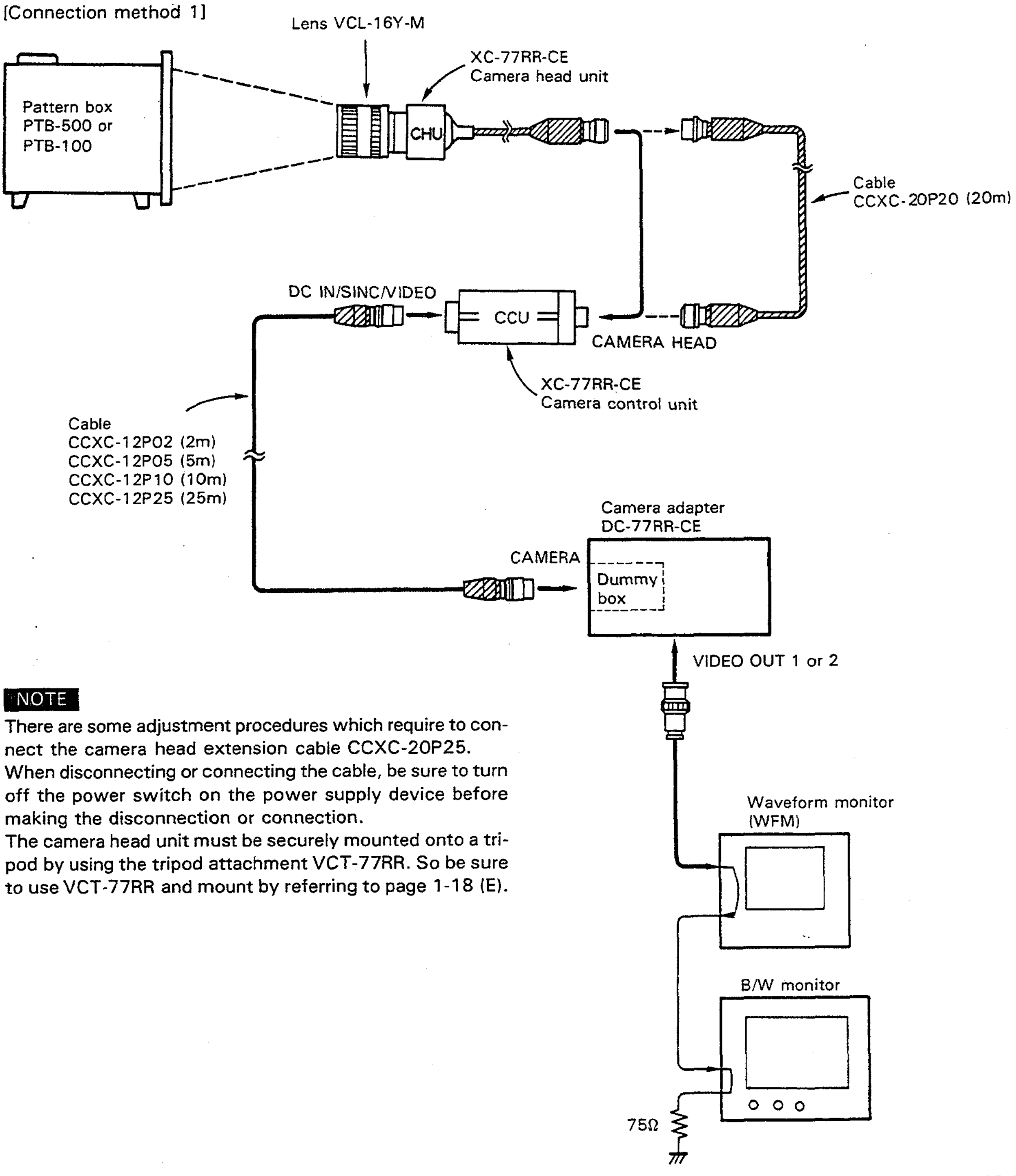
4-3. ADJUSTMENT OF PR-133 BOARD

4-3-1. Preparation

① Remove the upper case and rear panel by referring to "How to open the panel" section on page 1-19 (E).
② Remove the shield plate PR.

4-3-2. Connections

[Connection method 1]

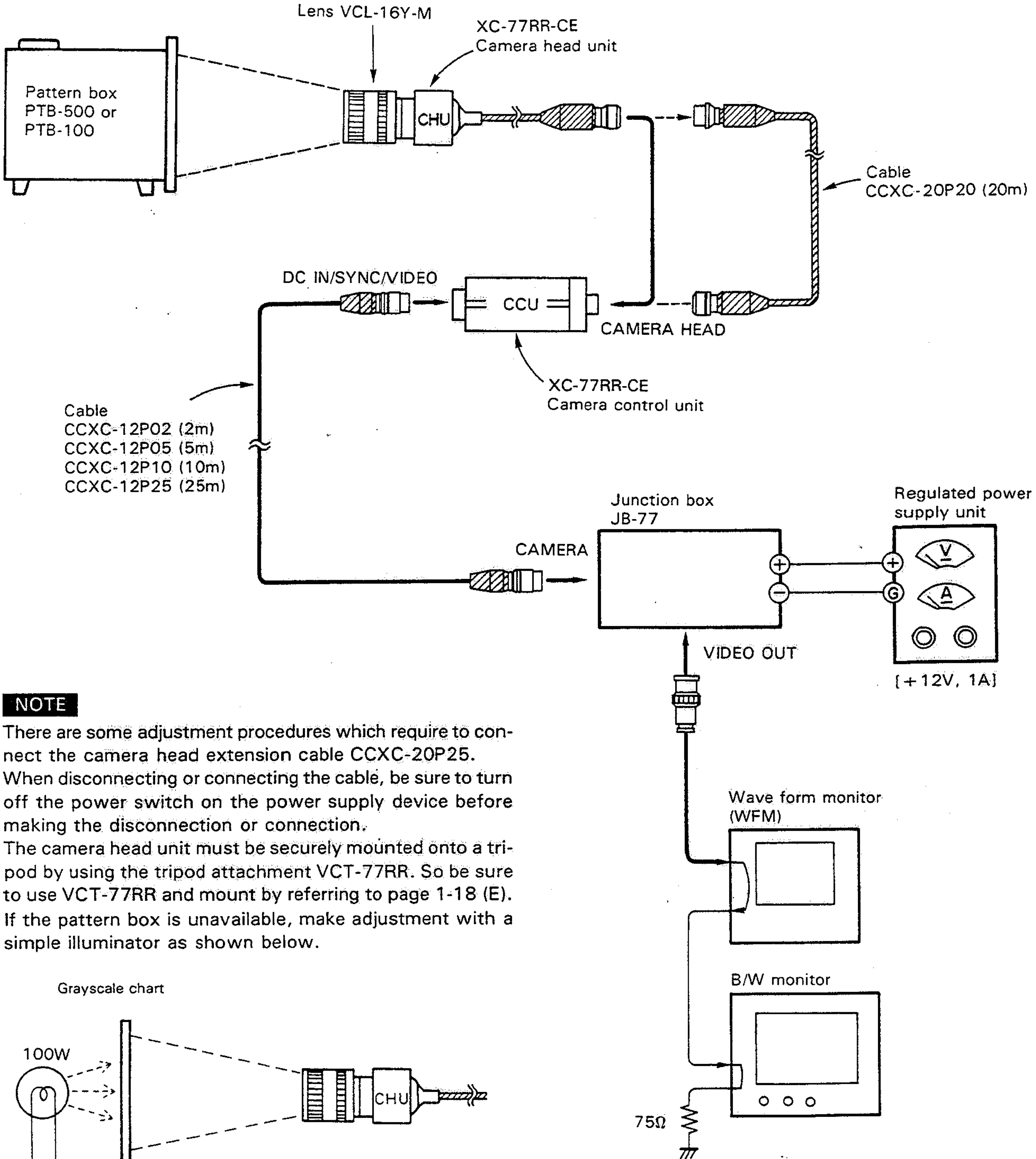


Lens VCL-16Y-M
XC-77RR-CE
Camera head unit
Pattern box
PTB-500 or
PTB-100
CHU
Cable
CCXC-20P20 (20m)
DC IN/SINC/VIDEO
CCU
CAMERA HEAD
XC-77RR-CE
Camera control unit
Cable
CCXC-12P02 (2m)
CCXC-12P05 (5m)
CCXC-12P10 (10m)
CCXC-12P25 (25m)
Camera adapter
DC-77RR-CE
CAMERA
Dummy
box
VIDEO OUT 1 or 2
Waveform monitor
(WFM)
B/W monitor
75Ω

NOTE

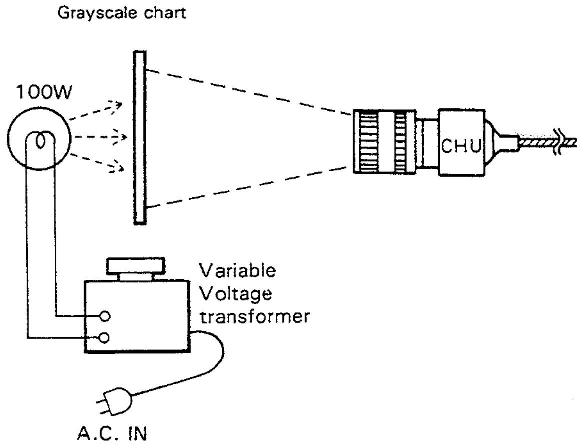
There are some adjustment procedures which require to connect the camera head extension cable CCXC-20P25. When disconnecting or connecting the cable, be sure to turn off the power switch on the power supply device before making the disconnection or connection.
The camera head unit must be securely mounted onto a tripod by using the tripod attachment VCT-77RR. So be sure to use VCT-77RR and mount by referring to page 1-18 (E).

[Connection method 2]


Lens VCL-16Y-M
XC-77RR-CE
Camera head unit
Pattern box
PTB-500 or
PTB-100
CHU
Cable
CCXC-20P20 (20m)
DC IN/SYNC/VIDEO
CCU
CAMERA HEAD
XC-77RR-CE
Camera control unit
Cable
CCXC-12P02 (2m)
CCXC-12P05 (5m)
CCXC-12P10 (10m)
CCXC-12P25 (25m)
Junction box
JB-77
Regulated power
supply unit
CAMERA
V
A
G
VIDEO OUT
[+12V, 1A]
Wave form monitor
(WFM)
B/W monitor
75Ω

NOTE

There are some adjustment procedures which require to connect the camera head extension cable CCXC-20P25.
When disconnecting or connecting the cable, be sure to turn off the power switch on the power supply device before making the disconnection or connection.
The camera head unit must be securely mounted onto a tripod by using the tripod attachment VCT-77RR. So be sure to use VCT-77RR and mount by referring to page 1-18 (E).
If the pattern box is unavailable, make adjustment with a simple illuminator as shown below.


Grayscale chart
100W
CHU
Variable
Voltage
transformer
A.C. IN

4-3-3. SHP and SHD Adjustments

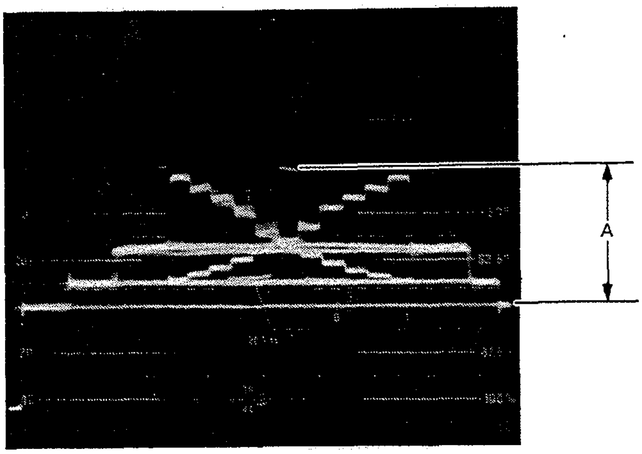
Preparation of SHP adjustment

- Subject: Grayscale chart
- Connect the camera head unit and camera control unit using the extension cable. (Before connecting the extension cable, be sure to turn the power off.)
- ⊘RV6: Mechanical center
- ⊘RV13: Clockwise full
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	OFF	FLD	2 : 1	OFF

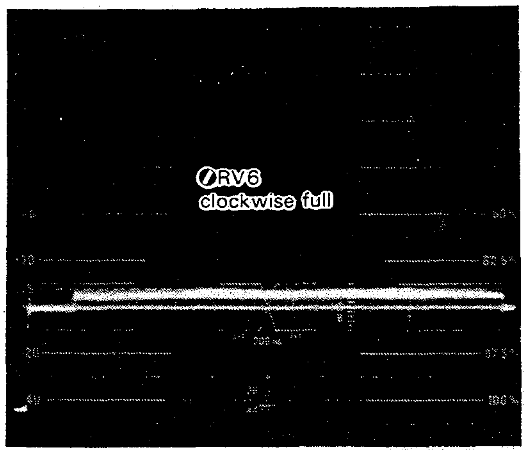
Iris adjustment

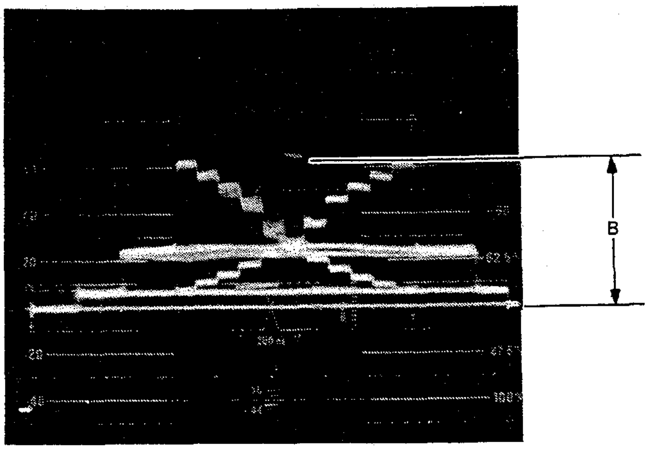
Equipment: Waveform monitor
Adj. point: Lens iris
Spec.: A ≒ 420mV

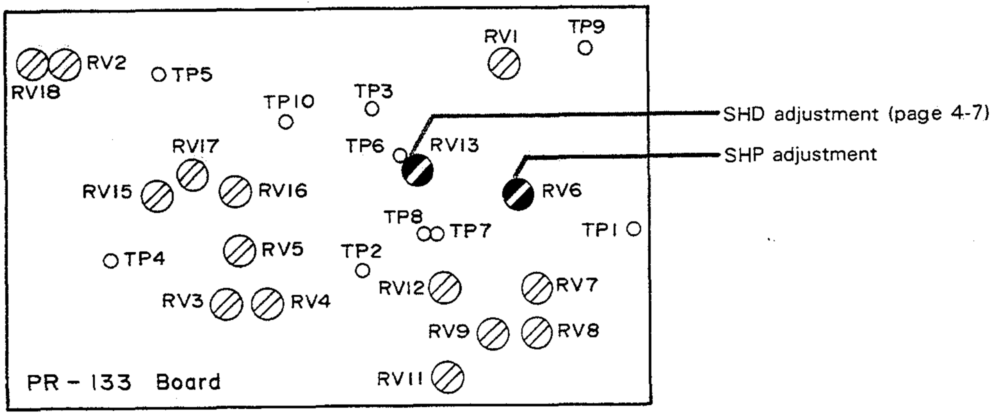


SHD adjustment

⊘RV6: Clockwise full
Equipment: Waveform monitor
Adj. point: Routate ⊘ RV6 counterclockwise slowly.
Spec.: Maximum B (Set at the second peak by rotating ⊘RV6 from the right side to the left side.)






RV2
RV18
TP5
RV1
TP9
TP10
TP3
SHD adjustment (page 4-7)
RV17
TP6
RV13
SHP adjustment
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR - 133 Board
RV11

(Front panel side)

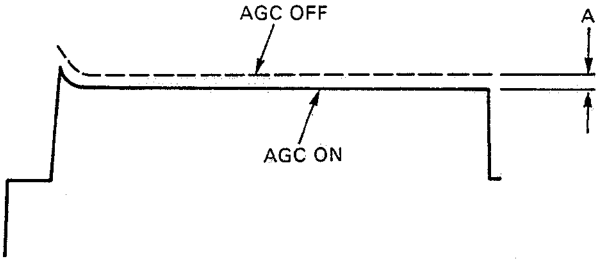
Preparation of SHD adjustment

- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	NON	OFF

SHD tentative adjustment

Equipment: Waveform monitor
Adj. point: ⊘RV13
Spec.: When the AGC ON/OFF switch is shifted from "OFF" to "ON", the level decreases 15^{+0}_{-7} mV (=A).



Confirmation

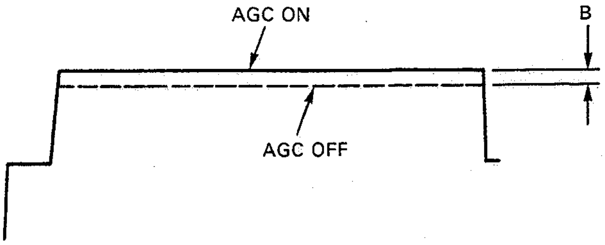
1. Ensure the AGC ON/OFF switch is set to "ON".
2. Ensure that FPN (Field Pattern Noise) is not shown on the black-and-white monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustments."
3. Set the lens iris at F5.6 then confirm that the picture quality on the black-and-white monitor is normal. If it is not normal, redo the procedures from "Preparation of SHP adjustment."
4. Ensure that when the SCAN 2:1/NON switch is switched to "2:1" the picture quality on the B/W monitor is normal. If it is not normal, redo the procedures from "Preparation of SHP adjustment."

SHD adjustment

- Disconnect the extension cable then connect the cable of the camera head unit to the camera control unit. (Before starting this procedure, turn the power off.)
- Set switches on inside cover panel of the camera control unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	2 : 1	OFF

Equipment: Waveform monitor
Adj. point: ⊘RV13
Spec.: When the AGC ON/OFF switch is shifted from "OFF" to "ON", the level decreases 15^{+0}_{-7} mV (=B).



Confirmation

1. Make sure that the AGC ON/OFF switch is set to "ON".
2. Ensure that FPN is not shown on the B/W monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustment."
3. Ensure that when the SCAN 2:1/NON switch is switched to "NON", FPN is not shown on the B/W monitor. If FPN is shown, redo the procedures from "Preparation of SHP adjustment."
4. Set the lens iris at F5.6, and confirm that the picture quality on the B/W monitor is normal. If not normal, redo the procedures from "Preparation of SHP adjustments."

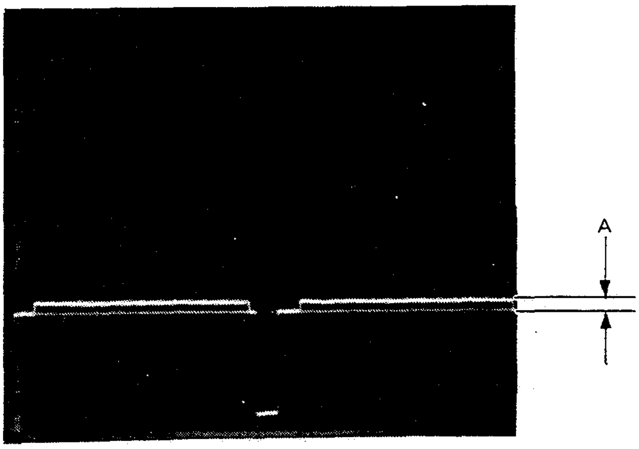
4-3-4. Set-up Adjustment

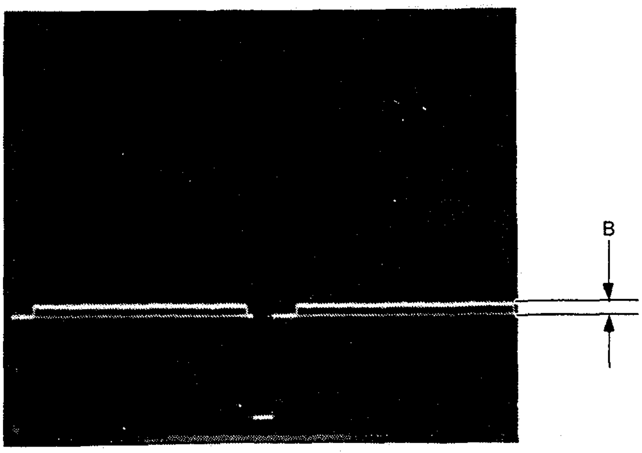
Preparation
- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

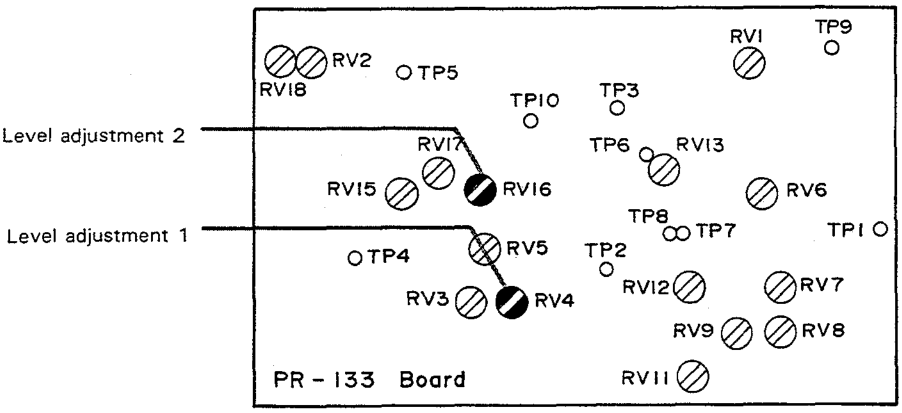
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

Level adjustment 1 (γ OFF)
Equipment: Waveform monitor
Adj. point: ⊘RV4
Spec.: A = 30 ± 5mV

Level adjustment 2 (γ ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘RV16
Spec.: B = 30 ± 5mV






RV2
RV18
TP5
RV1
TP9
TP10
TP3
Level adjustment 2
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
Level adjustment 1
RV5
TP4
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR - 133 Board

(Front panel side)

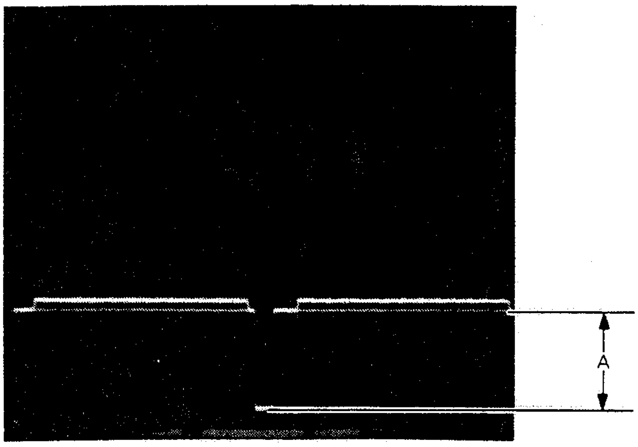
4-3-5. SYNC Adjustment

Preparation

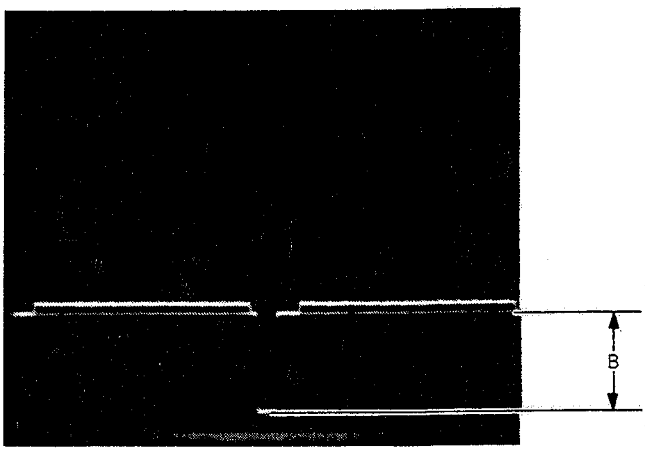
- Subject: Grayscale chart
- Lens iris: Closed
- Set switches on inside cover panel of the camera contorole unit as follows.

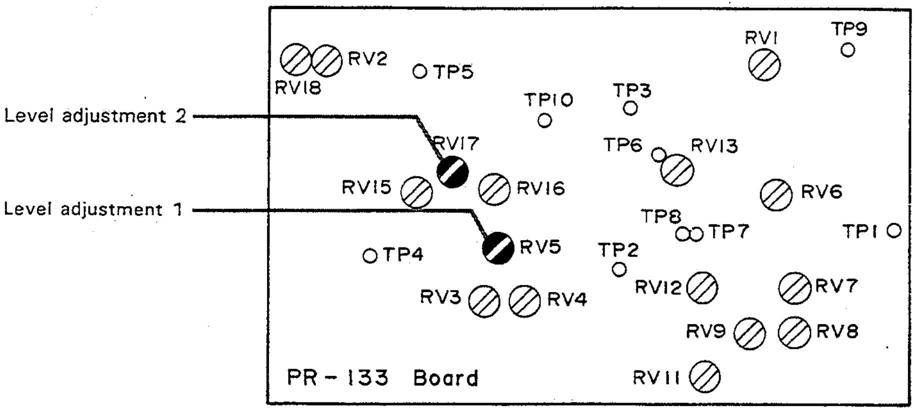
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

Level adjustment 1 (γ OFF)
Equipment: Waveform monitor
Adj. point: ● RV5
Spec.: A = 300 ± 10mV



Level adjustment 2 (γ ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ● RV17
Spec.: B = 300 ± 10mV




Level adjustment 2
Level adjustment 1
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR - 133 Board

(Front panel side)

4-3-6. Fixed Gain Sensitivity Adjustment

Preparation

- Subject: Grayscale chart
- Set switches on inside cover panel of the camera contorole unit as follows.

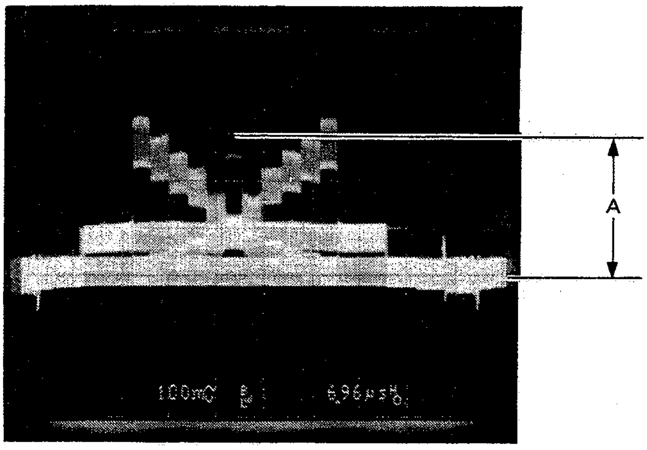
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

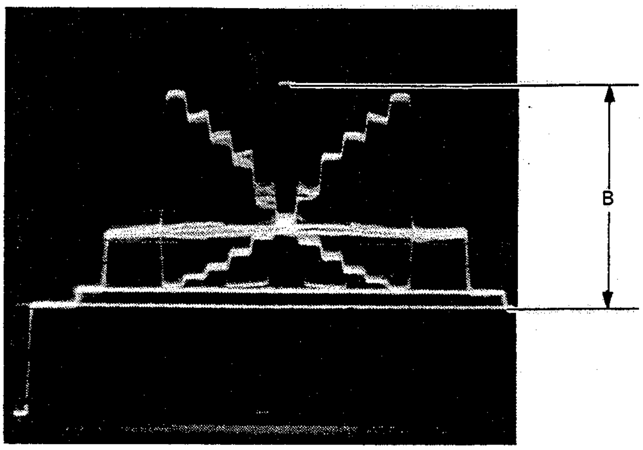
Iris adjustment

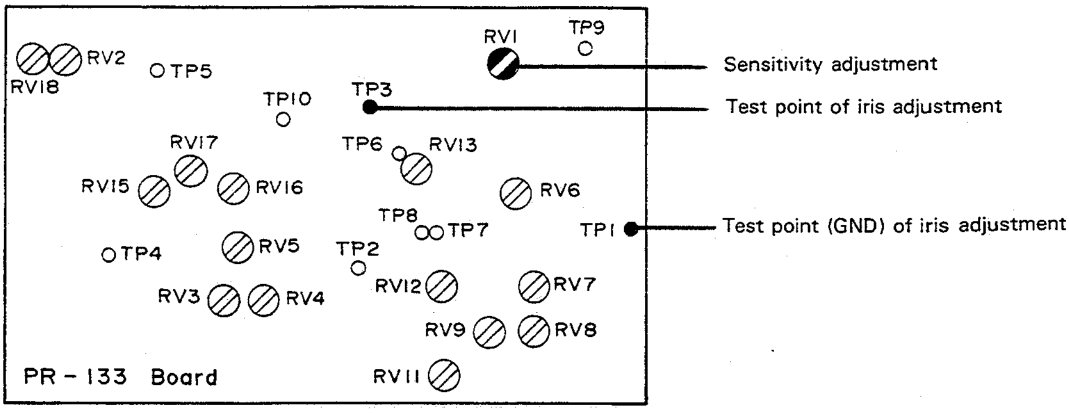
Equipment: Oscilloscope
Test point: TP3 (GND:TP1)
Adj. point: Len iris
Spec.: A = 300 ± 3mV

Sensitivity adjustment

Equipment: Waveform monitor
Adj. point: ⊘ RV1
Spec.: B = 700 ± 20mV


A
100mV
6.96µs




RV2
RV18
TP5
RV1
TP9
Sensitivity adjustment
TP10
TP3
Test point of iris adjustment
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
Test point (GND) of iris adjustment
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR – 133 Board
RV11

(Front panel side)

4-3-7. AGC Adjustment

Preparation

- Subject: Grayscale chart
- Set switches on inside cover panel of the camera contorole unit as follows.

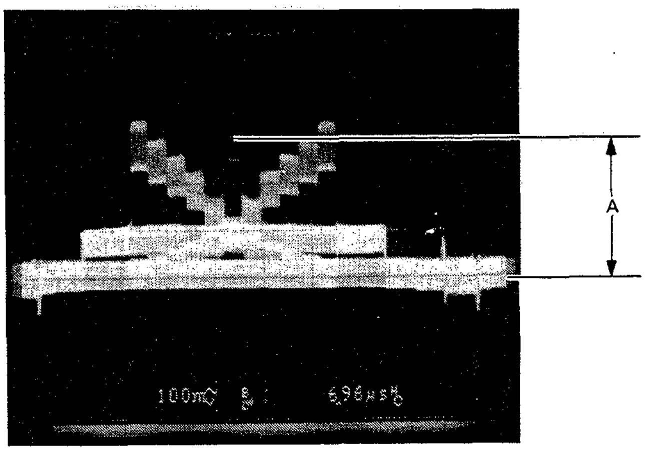
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

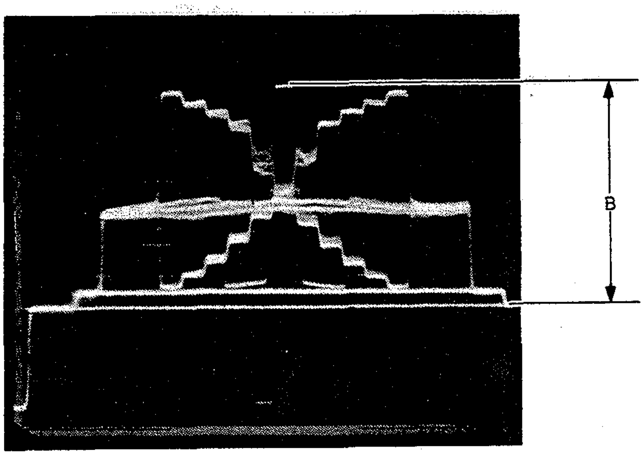
Iris adjustment(This step can be skipped when you work continuously from the preceding procedure.)

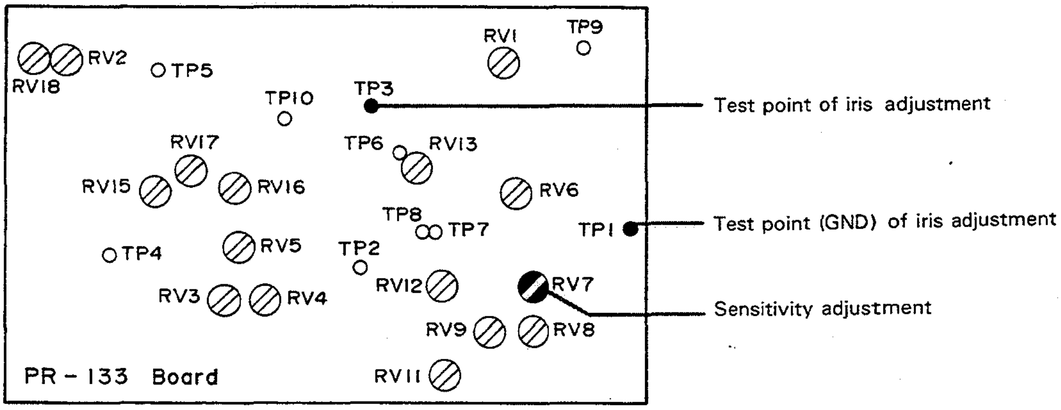
Equipment: Oscilloscope
Test point: TP3 (GND:TP1)
Adj. point: Len iris
Spec.: A = 300 ± 3mV

Sensitivity adjustment

GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV1
Spec.: B = 700 ± 20mV



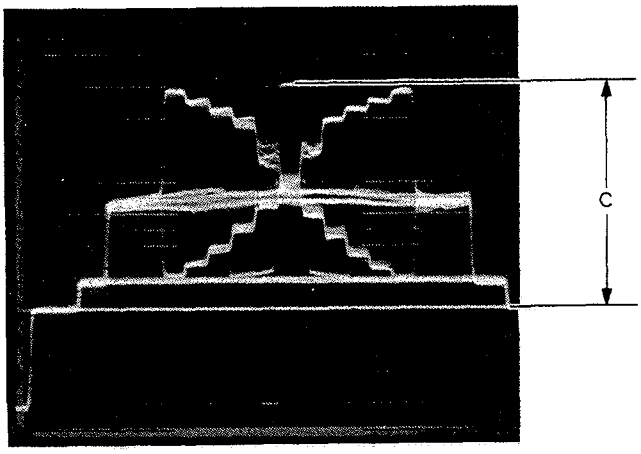



RV2
RV18
TP5
RV1
TP9
TP10
TP3
Test point of iris adjustment
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
Test point (GND) of iris adjustment
TP4
RV5
TP2
RV3
RV4
RV12
RV7
Sensitivity adjustment
RV9
RV8
PR - 133 Board
RV11

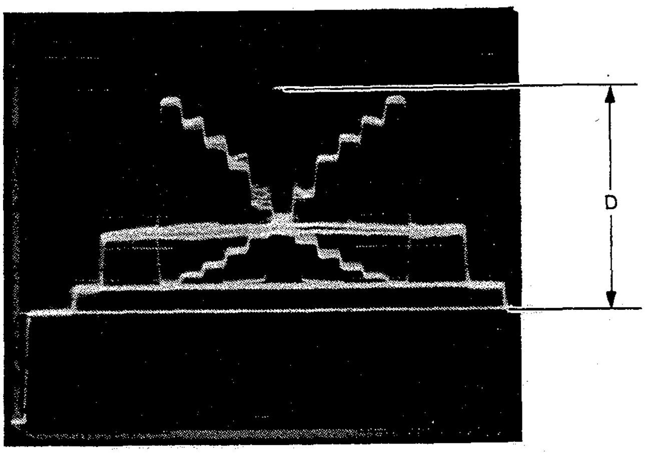
(Front panel side)

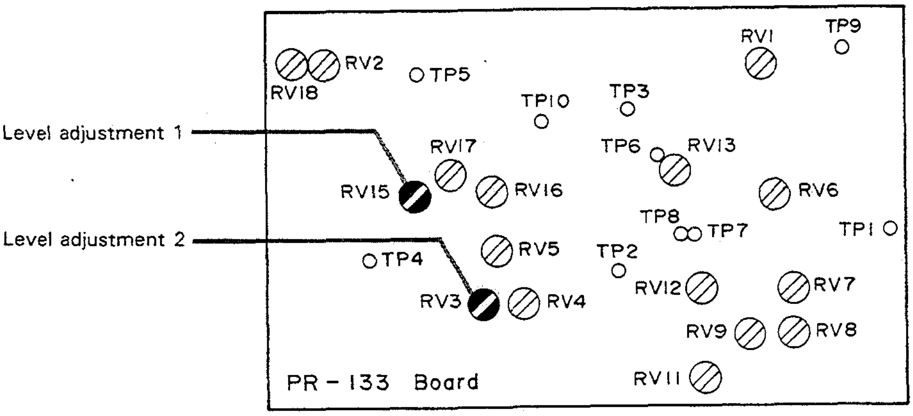
(AGC Adjutment, continued)

Level adjustment 1 (γ ON)
AGC ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV15
Spec.: C = 700 ± 20mV



Level adjustment 2 (γ OFF)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV3
Spec.: D = 700 ± 20mV

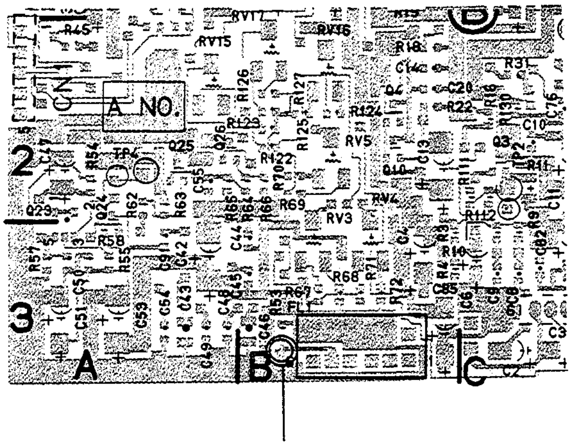



Level adjustment 1
Level adjustment 2
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR - 133 Board
RV11

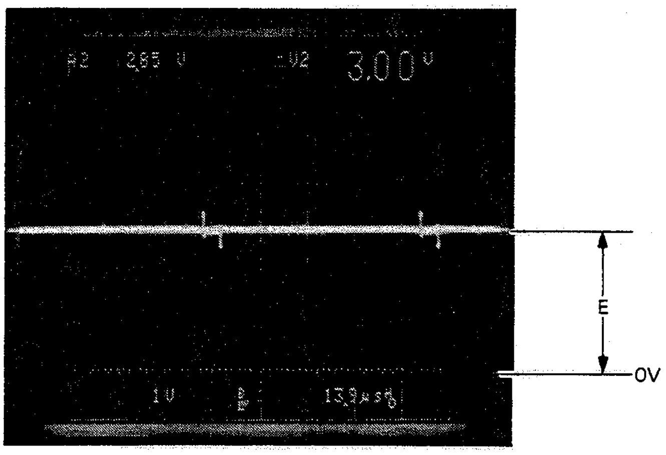
(Front panel side)

(AGC Adjustment, continued)

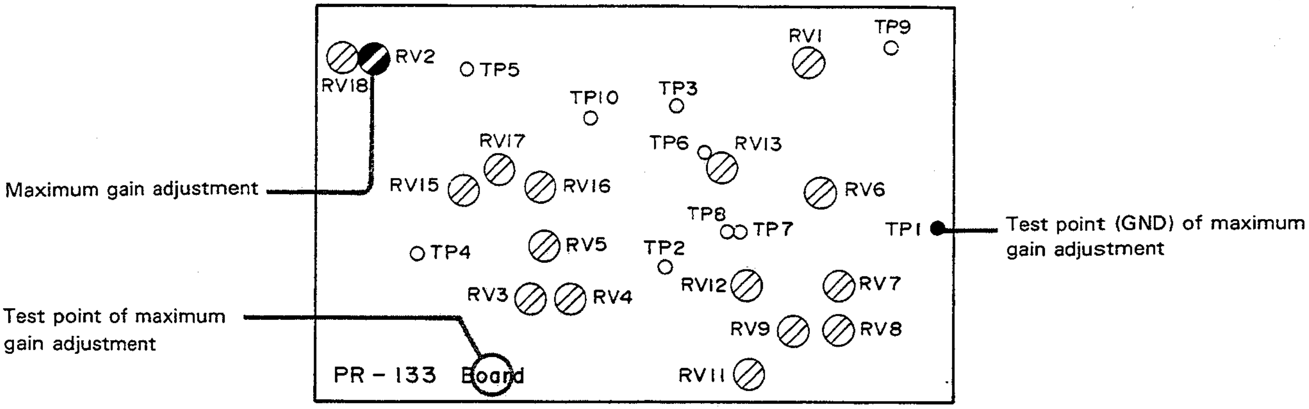
Maximum gain adjustment
Lens iris: Closed
Equipment: Oscilloscope
Test point: Refer to right figure (GND:TP1)
Adj. point: ⊘ RV2
Spec.: E=3.0±0.2V


A NO.
2
3
A
B
C
TP4
RV5
RV4
RV3
RV15
RV16
RV17

The maximum gain adjustment is to be made at this throughholerand.



Continue on to "4-3-8. White Clipping Adjustment"


Maximum gain adjustment
Test point of maximum gain adjustment
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
Test point (GND) of maximum gain adjustment
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR-133 Board

(Front panel side)

4-3-8. White Clipping Adjustment

Preparation

- Subject: White chart (Shoot only the pattern box.)
- Lens iris: Open
- Set switches on inside cover panel of the camera contorole unit as follows.

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
ON	OFF	OFF	FRM	2 : 1	OFF

AGC minimum gain adjustment

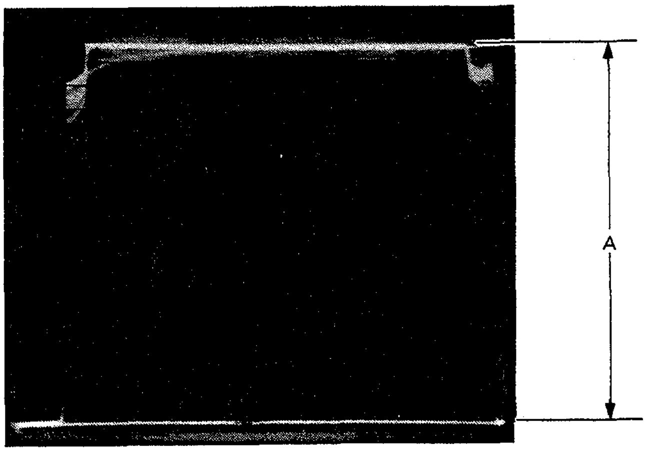
(Perform this procedure only when you work continuously from the AGC adjustment procedure.)

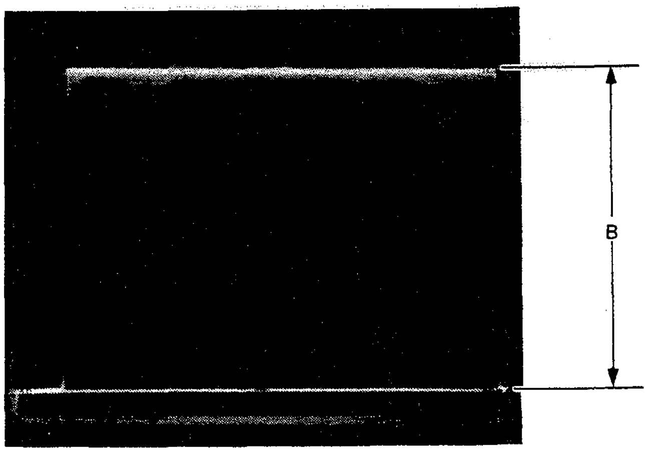
- Adjust ⊘ RV9 so as to obtain the maximum "A."

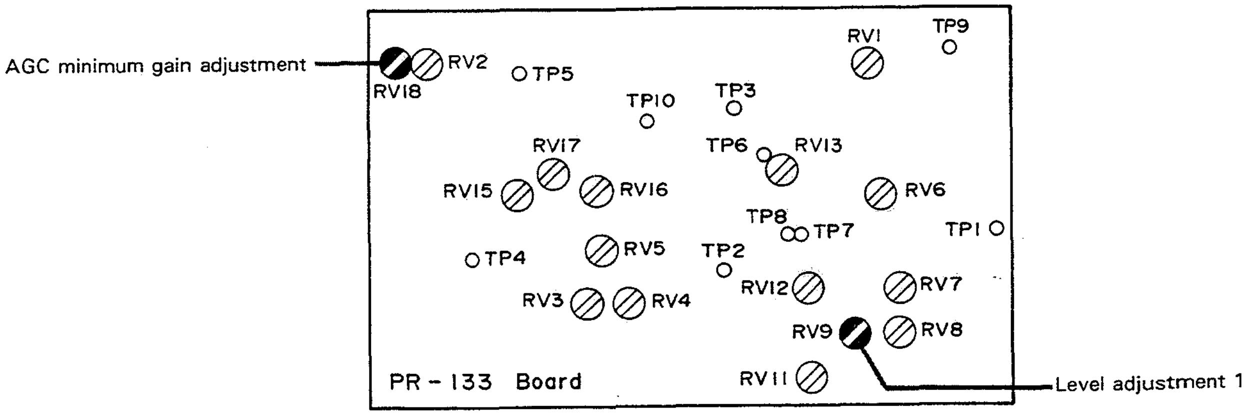
Equipment: Waveform monitor
Adj. point: ⊘ RV18
Spec.: A = 1200 ± 20mV

Level adjustment 1 (γ OFF, WC OFF)

AGC ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV9
Spec.: B = 100 ± 20mV






AGC minimum gain adjustment
RV18
RV2
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR-133 Board
RV11
Level adjustment 1

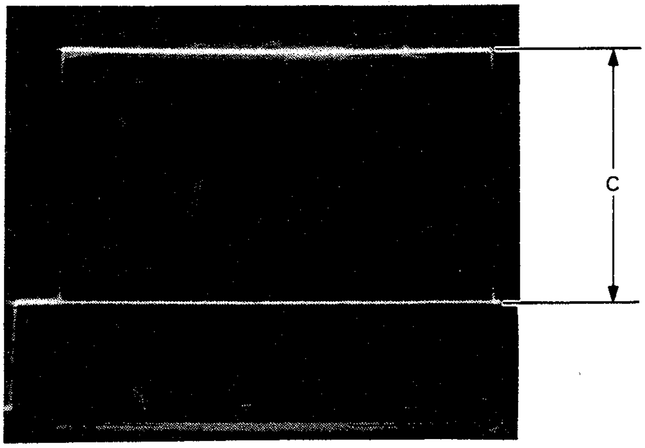
(Front panel side)

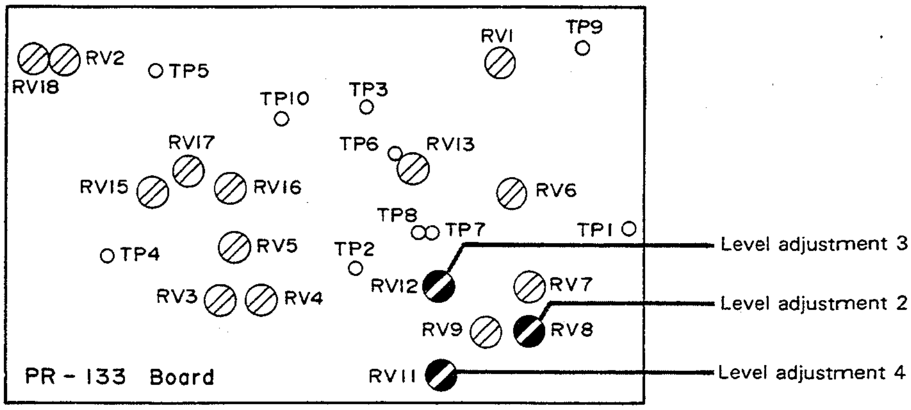
(White Clipping Adjustment, continued)

Level adjustment 2 (γ OFF, WC ON)
WHTCLP ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV8
Spec.: C = 800 ± 20mV

Level adjustment 3 (γ ON, WC ON)
GAMMA ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV12
Spec.: C = 800 ± 20mV

Level adjustment 4 (γ ON, WC OFF)
WHTCLP ON/OFF switch: "ON"
Equipment: Waveform monitor
Adj. point: ⊘ RV11
Spec.: C = 800 ± 20mV




RV2
RV18
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
PR - 133 Board
RV11
Level adjustment 3
Level adjustment 2
Level adjustment 4

(Front panel side)

目次

1. 取り扱い操作

1-1. 特長 ……………………1-1(J)
1-2. 使用上のご注意 ……………………1-3(J)
1-3. システム構成 ……………………1-4(J)
1-4. 各部の名称と働き ……………………1-6(J)
  1-4-1. CCDビデオカメラモジュール
    XC-77RR/77RR-CE ……………………1-6(J)
    カメラヘッドユニット ……………………1-6(J)
    カメラコントロールユニット(前面) …1-7(J)
    カメラコントロールユニット(後面) …1-13(J)
  1-4-2. カメラアダプター DC-77RR ……………………1-14(J)
    前面、内部 ……………………1-14(J)
    後面 ……………………1-16(J)
  1-4-3. 三脚アタッチメント VCT-77RR ……1-18(J)
1-5. カメラコントロールユニットの内部スイッチの
  設定 ……………………1-19(J)
  PR-133基板 ……………………1-20(J)
  TG-58基板 ……………………1-20(J)
  DR-96基板 ……………………1-21(J)
1-6. 接続 ……………………1-23(J)
  1-6-1. 接続する前に ……………………1-23(J)
  1-6-2. XC-77RR/77RR-CEをDC-77RRに
    組み込んで使用する場合 ……………………1-23(J)
    DC-77RRへの組み込みかた ……………………1-24(J)
    カメラヘッドユニットのケーブルの向きを
    変えるには ……………………1-25(J)
    カメラヘッド接続用端子とカメラケーブル
    とを固定するには ……………………1-26(J)
  1-6-3. S/VS/VBSのいずれかの信号で
    外部同期を行う場合 ……………………1-27(J)
  1-6-4. HD/VD信号で外部同期を行う場合 …1-28(J)
  1-6-5. XC-77RR/77RR-CE内部の同期信号を
    使用して他のカメラを同期させる場合 …1-29(J)
  1-6-6. 付属のねじについて ……………………1-30(J)
  1-6-7. 側板などに取りつけるときに使用する
    ねじの長さについて ……………………1-30(J)
1-7. CCD特有の現象 ……………………1-31(J)

2. 製品規格

2-1. 主な仕様 ……………………2-1
2-2. CCD出力波形タイミングチャート ……2-9
2-3. 外部同期について ……………………2-10
  2-3-1. S/VS/VBSモード ……………………2-10
  2-3-2. HD、VDモード ……………………2-10
  2-3-3. RESTART RESETモード ……………………2-17
2-4. モード設定 ……………………2-18
  2-4-1. 前面パネルにおけるモード設定 ……2-18
  2-4-2. カメラコントロールユニット内
    におけるモード設定 ……………………2-20
2-5. 電子シャッターについて ……………………2-22
  2-5-1. ノーマルシャッターモード ……………………2-22
  2-5-2. DONPISHAシャッターモード ……………………2-33
  2-5-3. ロングタームリセットシャッター ……2-33

3. 回路概説

3-1. CCDの動作原理 ……………………3-1
3-2. CCDの電荷転送の機構 ……………………3-1
3-3. PA-93基板 ……………………3-2
3-4. PR-133基板 ……………………3-3
3-5. TG-58基板 ……………………3-4
3-6. DR-96基板 ……………………3-4
3-7. SW-367基板 ……………………3-5

4. 調整要項

4-1. 使用機器 ……………………4-1
4-2. DR-96基板の調整 ……………………4-2
  4-2-1. 準備 ……………………4-2
  4-2-2. +9.5V電圧調整 ……………………4-3
  4-2-3. CCDサブストレート電圧調整 ……4-3
4-3. PR-133基板の調整 ……………………4-4
  4-3-1. 準備 ……………………4-4
  4-3-2. 接続図 ……………………4-4
  4-3-3. SHP/SHD調整 ……………………4-6
  4-3-4. セットアップ調整 ……………………4-8
  4-3-5. シンク調整 ……………………4-9
  4-3-6. 固定ゲイン調整 ……………………4-10
  4-3-7. AGC調整 ……………………4-11
  4-3-8. ホワイトクリップ調整 ……………………4-14

A. DIAGRAM

A-1. OVERALL BLOCK DIAGRAM A-1
A-2. FRAM DIAGRAM A-5
A-3. PA-93 BOARD A-11
A-4. PR-133 BOARD A-17
A-5. DR-96 BOARD A-29

B. SEMICONDUCTOR

C. REPAIR PARTS

C-1. PARTS INFORMATION.................................. C-1
C-2. ELECTRICAL PARTS LIST C-2
  DR-96 Board C-2
  FL-108 Board C-3
  HN-134 Board C-3
  PA-93 Board C-4
  PR-133 Board C-5
  SW-367 Board C-7
C-3. EXPLODED VIEW C-8
  Camera Head Unit C-8
  Camera Control Unit C-9
C-4. ACCESSORIES AND PACKING MATERIALS .. C-11

D. CONVERSION TABLE FOR DECIMAL INTEGERS AND HEXADECIMAL INTEGERS

第１章
取り扱い操作

1-1. 特長

XC-77RR/77RR-CEシステムは、固体撮像素子CCD(Charge Coupled Device)を採用した白黒ビデオカメラモジュールXC-77RR/77RR-CEに、カメラアダプターDC-77RRを組み合わせたカメラシステムです。

高画質化

XC-77RRは768×493画素、XC-77RR-CEは756×581画素を持つCCDにより、きめ細かな像を再現します。

また、XC-77RR-CEは、画素の縦横の配列が等間隔になっているためアドレッシングがしやすく、正確なアドレッシングが要求される画像処理システムに適しています。

カメラのヘッド部とコントロール部を分離

半導体産業やマイクロスコープでの使用に対応するため、カメラのヘッド部とコントロール部を分離し、それぞれを小型・軽量化しました。

ヘッド部とコントロール部との距離は、延長ケーブルCCXC-20P20を使用すると、最大25mまで延長することができます。

カメラコントロールユニットとカメラアダプターの一体化が可能

カメラコントロールユニットは、カメラアダプターDC-77RRに組み込んで、一体化して使用することができます。

電子シャッター機能

任意のスピードに設定できる電子シャッター機能を備えています。動きの速い被写体を鮮明に撮影でき、静止画やスロー再生時にぶれのない画像を得ることができます。

なお、電子シャッター機能には、次の2種類があります。

ノーマルシャッター機能：従来の電子シャッター機能

DONPISHAシャッター機能：外部トリガー信号(リセットパルス)によって、任意のタイミングで画像情報の蓄積を開始するモードです。蓄積時間は、前面パネル上のスイッチで設定します。このモードを使用すると、移動体の画像を任意のタイミングで静止画として取り出すことができます。

多様な信号処理方式に対応

XC-77RR/77RR-CEの内部スイッチによって次の設定が可能です。

・ゲイン：AGC(オートゲインコントロール)／固定ゲイン(0dB)

・ガンマ：補正／1

・ホワイトクリップ：110 IRE ／140 IRE(XC-77RR)
　110 %／140 %(XC-77RR-CE)

・電荷蓄積モード：フレーム蓄積モード／フィールド蓄積モード

・走査モード：インターレース／ノンインターレース

・シャッターモード：ノーマル/DONPISHA

XC-77RR：
　ノーマルシャッターモード： 1/63秒～1/3,580,000秒
　DONPISHAシャッターモード： 1/3.6秒～1/2,200秒

XC-77RR-CE：
　ノーマルシャッターモード： 1/52秒～1/2,360,000秒
　DONPISHAシャッターモード： 1/3.6秒～1/1,360秒

3種類の外部同期が可能

外部の同期信号発生器を使用して外部同期を行うことができます。この場合、次の3種類の同期信号が使用できます。

・HD、VD信号：HD(水平駆動)信号およびVD(垂直駆動)信号から、インターレース方式かノンインターレース方式かを自動的に識別し、その方式に応じて同期がかかります。

・S/VS/VBS信号：S(複合同期)信号、VS(映像/複合同期)信号、VBS(映像／バースト／複合同期)信号のいずれかによって同期をかけます。(HD、VD信号による同期方式とS/VS/VBS信号による同期方式は、入力信号によって自動的に切り換わります)

・リセットパルス：CCDの蓄積を任意のタイミングで行いたいとき、リセットパルスを入力して、蓄積開始のタイミングを決めることができます。

内部同期信号出力

内部VD信号およびHD信号は、内部スイッチを切り換えることによって、12ピンコネクターから出力することができます。

堅牢な筐体

本機の外装は、アルミダイキャストおよび鉄板で構成されています。ヘッド部の筐体固定時に基準となる面にネジ穴が設けてあり、これを利用して光軸のずれを最小限にとどめることができます。

XC-77シリーズとの互換性

VIDEO OUT(映像信号出力)端子の種類や12ピンマルチコネクターのピン配置は、XC-77シリーズと共通していますので、XC-77シリーズのカメラモジュールの代わりに、XC-77RR/77RR-CEをそのまま設置することができます。

1-2.　使用上のご注意

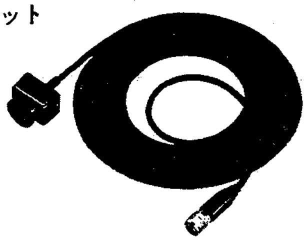
電源	「2-1.主な仕様」に記された電源でご使用ください。
内部に異物を入れないでください	内部に燃えやすいものや、金属片、水などが入ると、故障や事故の原因となります。
動作中は布などで包まないでください	内部の温度上昇を防ぐため、動作中に布などで包まないでください。
使用・保管場所	次のような場所での使用および保管は避けてください。 ・極端に暑い場所 ・直射日光があたる所や暖房器具の近く ・湿気、ほこりの多い場所 ・激しい振動のある場所 ・強い磁気を発生するものの近く ・強力な電波を発生するテレビ・ラジオの送信所の近く
強い衝撃を与えないでください	落としたりして強い衝撃を与えると、故障することがあります。
輸送の際は	付属のカートン、または同等品で梱包し、強い衝撃を与えないように注意してください。
お手入れ	キャビネットやパネルの汚れは、乾いた柔らかい布で軽くふきとってください。汚れがひどいときは、中性洗剤溶液を少し含ませた布でふきとり、乾いた布で仕上げてください。
異常が生じた場合は	万一、異常な音、臭い、煙が出たときは、すぐに電源を切り、電源コードを抜いて、お買い上げ店にご連絡ください。

1-3. システム構成

CCDビデオカメラモジュールXC-77RR/77RR-CEを中心としたシステムの構成は、次の通りです。

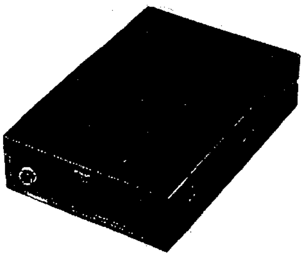
CCDビデオカメラモジュール XC-77RR/77RR-CE

カメラヘッドユニット



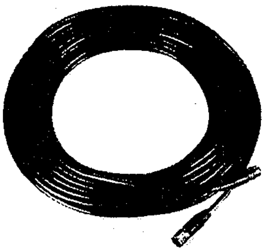
カメラコントロールユニット

カメラアダプター DC-77RR



カメラヘッド延長ケーブル CCXC-20P20(20m)

XC-77RR/77RR-CEのカメラヘッドユニットとカメラコントロールユニットの間を延長する場合に使用します。



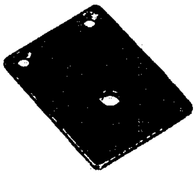
標準レンズ VCL-16Y-M

12ピンコネクター PC-XC12

DC-77RR以外のカメラアダプターにXC-77RR/77RR-CEを接続する場合に、このコネクターを使用して接続ケーブルを作ります。

三脚アタッチメント VCT-77RR

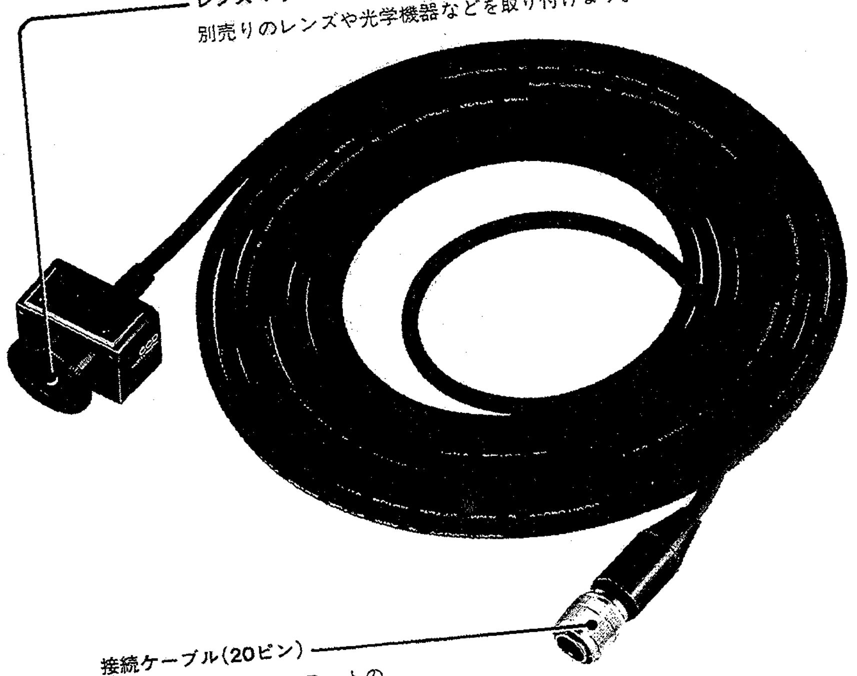
カメラアダプターを三脚に取り付ける場合に使用します。



1-4. 各部の名称と働き

1-4-1. CCDビデオカメラモジュール XC-77RR/77RR-CE

カメラヘッドユニット

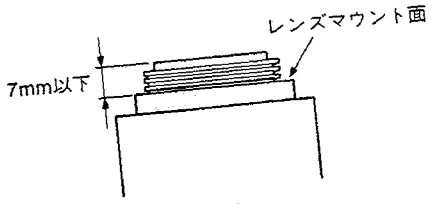


レンズマウント(Cマウント)
別売りのレンズや光学機器などを取り付けます。

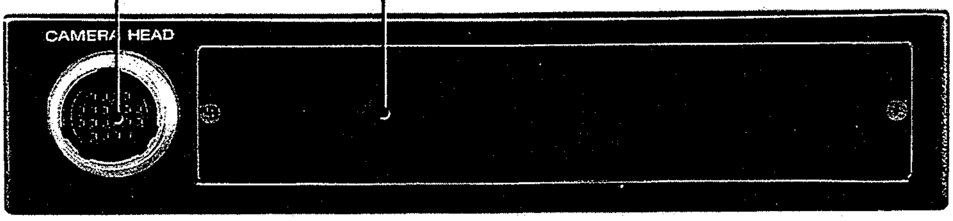
接続ケーブル(20ピン)
カメラコントロールユニットの
カメラヘッド接続用端子に接続します。

ご注意

Cマウント式のレンズは、レンズマウント面からの飛び出し量が7mm以下の物を使用してください。



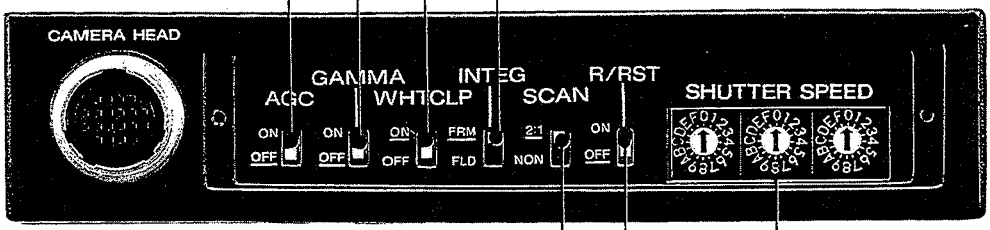
カメラコントロールユニット（前面）


CAMERA HEAD

CAMERA HEAD（カメラヘッド）接続用端子（20ピン）
カメラヘッドユニットからの接続ケーブルまたはその延長ケーブル（別売り）を接続します。

前面パネル
左右のネジをはずしてこのパネルを開くと、スイッチが現れます。

前面パネル内部


CAMERA HEAD
AGC
ON
OFF
GAMMA
ON
OFF
WHTCLP
ON
OFF
INTEG
FRM
FLD
SCAN
2:1
NON
R/RST
ON
OFF
SHUTTER SPEED

1 AGC ON/OFFスイッチ

2 GAMMA ON/OFFスイッチ

3 WHTCLP ON/OFFスイッチ

4 INTEG FRM/FLD切り換えスイッチ

5 SCAN 2:1/NON切り換えスイッチ

6 R/RST ON/OFFスイッチ

7 SHUTTER SPEED設定スイッチ

1 AGC（オートゲインコントロール）ON/OFFスイッチ

ON：オートゲインコントロール

OFF：固定ゲイン＝0dB（工場出荷時の設定）

2 GAMMA（ガンマ補正）ON/OFFスイッチ

ON：ガンマ補正

OFF：ガンマ＝1（工場出荷時の設定）

3 WHTCLP（ホワイトクリップ）ON/OFFスイッチ

ON：クリップレベル＝110 IRE（XC-77RR）／110%（XC-77RR-CE）
（工場出荷時の設定）

OFF：クリップレベル＝140 IRE（XC-77RR）／140%（XC-77RR-CE）

4 INTEG FRM/FLD（蓄積モードフレーム/フィールド）切り換えスイッチ

FRM：フレーム蓄積モード（工場出荷時の設定）

FLD：フィールド蓄積モード

5 SCAN 2:1/NON（2:1インターレース/ノンインターレース）切り換えスイッチ

2:1：2:1インターレース（工場出荷時の設定）

NON：ノンインターレース

このスイッチは、本機が内部クロックに同期しているときにのみ有効です。本機を外部同期信号に同期させる場合は、2:1に設定してください。

6 R/RST（リスタートリセット）ON/OFFスイッチ

- SHUTTER SPEED設定スイッチ7が"000"に設定されている場合は、リスタートリセットモードをON/OFFします。
- SHUTTER SPEED設定スイッチ7が"000"以外に設定されている場合は、電子シャッターのモードを、DONPISHAシャッターモードにするか、ノーマルシャッターモードにするかを切り換えます。

  ON：DONPISHAシャッターモード

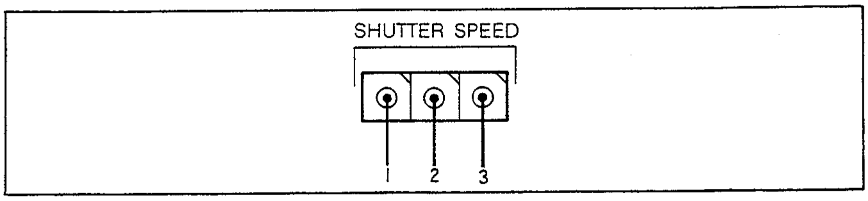
  OFF：ノーマルシャッターモード（工場出荷時の設定）

  それぞれのシャッタースピードは、SHUTTER SPEED設定スイッチ7で設定します。

⑦ SHUTTER SPEED（シャッタースピード）設定スイッチ

シャッタースピードを設定します。1、2、3のスイッチは、それぞれ16進数の桁を示します。

各スイッチで設定されるシャッタースピードの値は、XC-77RRとXC-77RR-CEとで、また、ノーマルシャッターモードとDONPISHAシャッターモードとで、異なりますのでご注意ください。



工場出荷時の設定

$$\left.\begin{array}{l}\text{1の設定}:0\\ \text{2の設定}:0\\ \text{3の設定}:0\end{array}\right\}\text{電子シャッター機能OFF}$$

XC-77RR

a）ノーマルシャッターモードの場合

$$\begin{pmatrix}\text{1の設定}=0\\ \text{2の設定}=0\\ \text{3の設定}=1\end{pmatrix}\sim\begin{pmatrix}\text{1の設定}=0\\ \text{2の設定}=\text{F}\\ \text{3の設定}=2\end{pmatrix}\text{のとき}$$

$$\text{シャッタースピード(秒)}=\frac{113{,}597-455[(\text{1の設定})\times16^2+(\text{2の設定})\times16+(\text{3の設定})]}{7{,}159{,}091}$$

$$\begin{pmatrix}\text{1の設定}=0\\ \text{2の設定}=\text{F}\\ \text{3の設定}=3\end{pmatrix}\sim\begin{pmatrix}\text{1の設定}=6\\ \text{2の設定}=\text{D}\\ \text{3の設定}=\text{D}\end{pmatrix}\text{のとき}$$

$$\text{シャッタースピード(秒)}=\frac{3516-2[(\text{1の設定})\times16^2+(\text{2の設定})\times16+(\text{3の設定})]}{7{,}159{,}091}$$

$$\begin{pmatrix}\text{1の設定}=6\\ \text{2の設定}=\text{D}\\ \text{3の設定}=\text{E}\end{pmatrix}\sim\begin{pmatrix}\text{1の設定}=\text{F}\\ \text{2の設定}=\text{F}\\ \text{3の設定}=\text{F}\end{pmatrix}\text{のとき}$$

この設定では、正常な信号が出力されませんので、設定しないでください。

b）DONPISHA シャッターモードの場合

$$\text{シャッタースピード(秒)}=\frac{5609+910[(\text{1の設定})\times16^2+(\text{2の設定})\times16+(\text{3の設定})]}{14{,}318{,}182}$$

シャッタースピード設定例(XC-77RR)

シャッタースピード (秒)	シャッター モード	SHUTTER SPEED設定用スイッチ		
		1の設定	2の設定	3の設定
1/100	ノーマル	0	5	C
	DONPISHA	0	9	7
1/120	ノーマル	0	7	7
	DONPISHA	0	7	D
1/250	ノーマル	0	B	B
	DONPISHA	0	3	9
1/500	ノーマル	0	D	A
	DONPISHA	0	1	9
1/1000	ノーマル	0	E	A
	DONPISHA	0	0	A
1/2000	ノーマル	0	F	2
	DONPISHA	0	0	2
1/4000	ノーマル	3	5	F
	DONPISHA	—	—	—
1/10,000	ノーマル	5	7	8
	DONPISHA	—	—	—

上記のシャッタースピードは、フィールド蓄積モードの場合の値を表示しています。フレーム蓄積モードでは、上記の表に示した蓄積時間に対して、偶数フィール側が5.04μsec長くなります。したがって、シャッタースピードが高速の場合は、各フィールドの蓄積時間の違いによりフリッカーが生じます。
XC-77RRの場合、電子シャッターは、フィールド蓄積モードで使用することをお薦めします。

XC-77RR-CE

a）ノーマルシャッターモードの場合

$$\begin{pmatrix}1\text{の設定}=0\\2\text{の設定}=0\\3\text{の設定}=1\end{pmatrix}\sim\begin{pmatrix}1\text{の設定}=1\\2\text{の設定}=1\\3\text{の設定}=\mathrm{F}\end{pmatrix}\text{のとき}$$

$$\text{シャッタースピード(秒)}=\frac{601-2\left[(1\text{の設定})\times16^2+(2\text{の設定})\times16+(3\text{の設定})\right]}{31{,}250}$$

$$\begin{pmatrix}1\text{の設定}=1\\2\text{の設定}=2\\3\text{の設定}=0\end{pmatrix}\sim\begin{pmatrix}1\text{の設定}=\mathrm{B}\\2\text{の設定}=5\\3\text{の設定}=0\end{pmatrix}\text{のとき}$$

$$\text{シャッタースピード(秒)}=\frac{1159}{1{,}418{,}750}-\frac{(1\text{の設定})\times16^2+(2\text{の設定})\times16+(3\text{の設定})}{3{,}546{,}875}$$

$$\begin{pmatrix}1\text{の設定}=\mathrm{B}\\2\text{の設定}=5\\3\text{の設定}=1\end{pmatrix}\sim\begin{pmatrix}1\text{の設定}=\mathrm{F}\\2\text{の設定}=\mathrm{F}\\3\text{の設定}=\mathrm{F}\end{pmatrix}\text{のとき}$$

この設定では、正常な信号が出力されませんので、設定しないでください。

b）DONPISHAシャッターモードの場合

$$\text{シャッタースピード(秒)}=\frac{10{,}149+908\left[(1\text{の設定})\times16^2+(2\text{の設定})\times16+(3\text{の設定})\right]}{14{,}187{,}500}$$

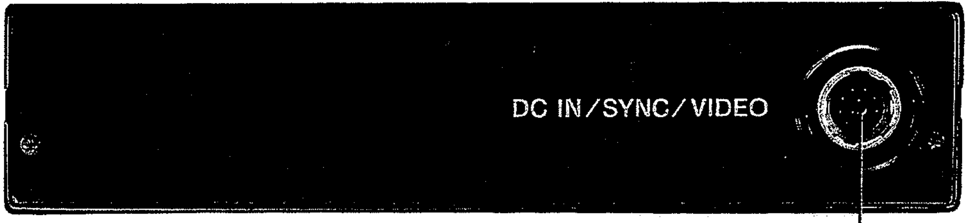
シャッタースピード設定例（XC-77RR-CE）

シャッタースピード（秒）	シャッターモード	SHUTTER SPEED設定用スイッチ		
		1の設定	2の設定	3の設定
1/100	ノーマル	0	9	0
	DONPISHA	0	9	1
1/120	ノーマル	0	A	A
	DONPISHA	0	7	7
1/250	ノーマル	0	E	E
	DONPISHA	0	3	3
1/500	ノーマル	1	0	D
	DONPISHA	0	1	4
1/1000	ノーマル	1	1	D
	DONPISHA	0	0	4
1/2000	ノーマル	4	6	4
	DONPISHA	—	—	—
1/4000	ノーマル	7	D	B
	DONPISHA	—	—	—
1/10,000	ノーマル	9	E	F
	DONPISHA	—	—	—

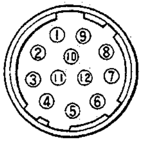
上記のノーマルシャッターモードのスピードは、フィールド蓄積モードの場合の値を表示しています。フレーム蓄積モードでは、上記の表に示した蓄積時間に対して、偶数フィールド側が5.04μsec長くなります。したがって、シャッタースピードが高速の場合は、各フィールドの蓄積時間の違いによりフリッカーが生じます。

XC-77RR-CEの場合、ノーマルシャッターは、フィールド蓄積モードで使用することをお薦めします。

カメラコントロールユニット(後面)



DC IN/SYNC/VIDEO端子(12ピン)
カメラアダプターに接続します。
この端子のピン配置は、下記の通りです。



信号 / ピンNo.	同期モード		
	外部同期モード		内部同期モード
	HD、VD	S/VS/VBS	
1	アース	アース	アース
2	+12V	+12V	+12V
3	映像出力(アース)	映像出力(アース)	映像出力(アース)
4	映像出力(信号)	映像出力(信号)	映像出力(信号)
5	HD入力(アース)	——	内部HD出力(アース)
6	HD入力(信号)	——	内部HD出力(信号)
7	VD入力信号/トリガー*入力	S/VS/VBS入力(信号)	内部VD出力(信号)
8	内部VD出力(アース)	内部VD出力(アース)	内部VD出力(アース)
9	内部VD出力(信号)/ 内部クロック出力**	内部VD出力(信号)/ 内部クロック出力**	内部VD出力(信号)/ 内部クロック出力**
10	アース	アース	アース
11	+12V	+12V	+12V
12	VD入力(アース)	S/VS/VBS入力(アース)	内部VD出力(アース)

工場出荷時は、外部同期方式に設定されています。HD、VD方式とS/VS/VBS方式の切り換えは、入力信号に応じて自動的に行われます。

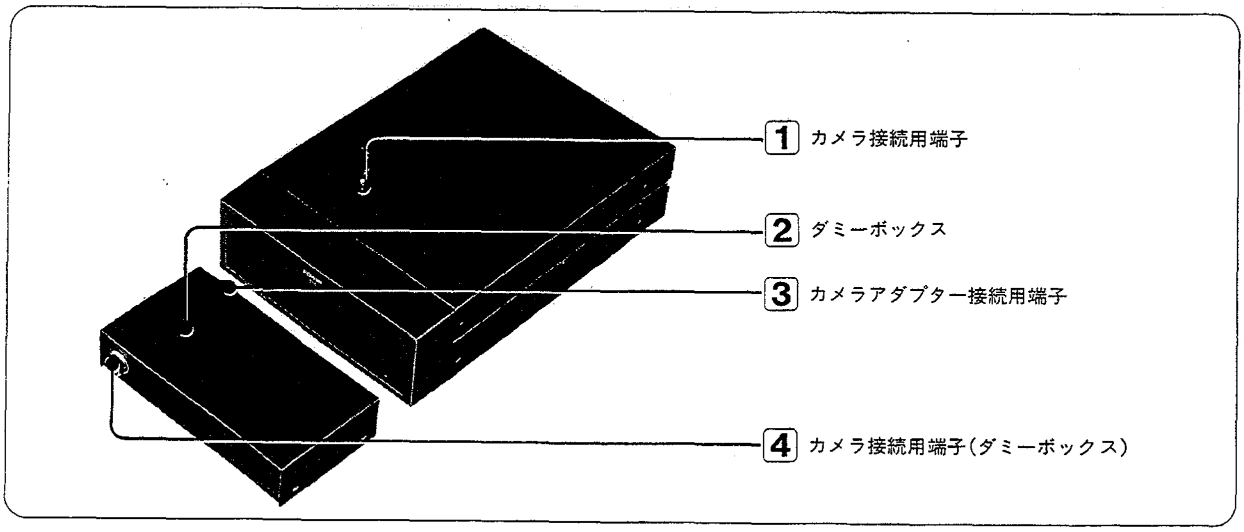
内部同期信号出力のHD出力(ピンNo.6)およびVD出力(ピンNo.7)を使用する場合は、内部のDR-96基板のスイッチ設定が必要です。

*トリガー:DONPISHAシャッターモードの入力リセット用パルス

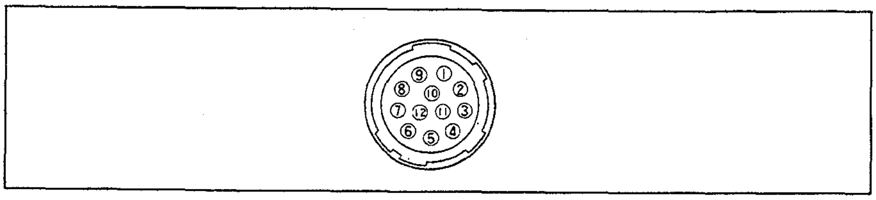
**ピンNo.9の出力信号は、内部のDR-96基板のスイッチを使用して、内部VD信号から内部クロック信号に切り換えることができます。

1-4-2. カメラアダプター DC-77RR

前面、内部


1 カメラ接続用端子
2 ダミーボックス
3 カメラアダプター接続用端子
4 カメラ接続用端子(ダミーボックス)

1 カメラ接続用端子(12ピン)

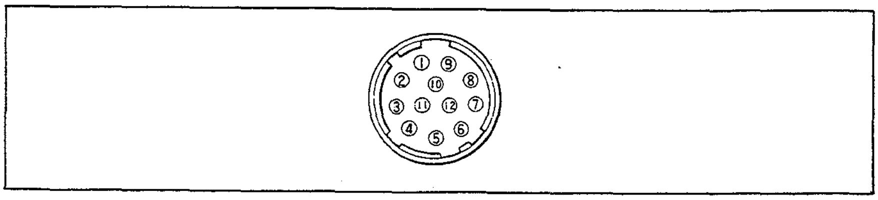

⑨ ① ⑧ ⑩ ② ⑦ ⑫ ⑪ ③ ⑥ ⑤ ④

XC-77RR/77RR-CEを組み込んで使用する場合は、この端子にXC-77RR/77RR-CEのDC IN/SYNC/VIDEO端子を差し込みます。

2 ダミーボックス

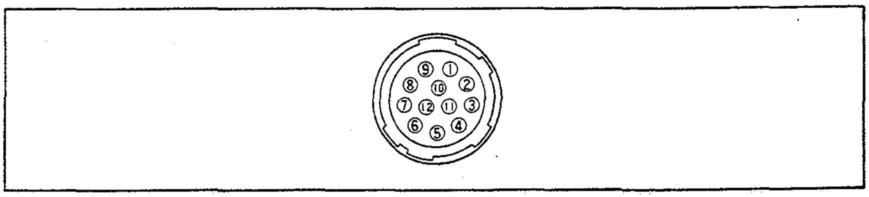
XC-77RR/77RR-CEを組み込んで使用する場合は、ダミーボックスをはずして、かわりにXC-77RR/77RR-CEを組み込みます。

3 カメラアダプター接続用端子(12ピン)


① ⑨ ② ⑩ ⑧ ③ ⑪ ⑫ ⑦ ④ ⑤ ⑥

ダミーボックスをカメラアダプターに組み込んで接続する場合は、この端子をカメラアダプターのカメラ接続用端子に差し込みます。

④ カメラ接続用端子(ダミーボックス)(12ピン)



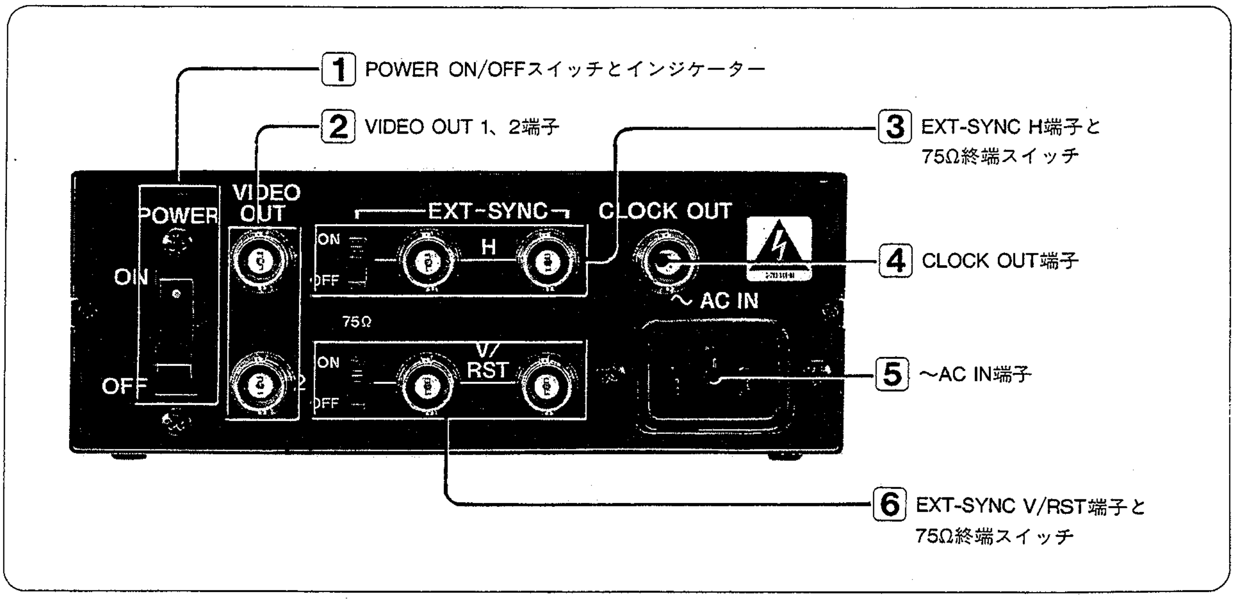
カメラアダプターを、XC-77RR/77RR-CE以外のカメラのカメラアダプターとして使用する場合は、DC-77RRにダミーボックスを組み込み、この端子を使用してカメラと接続します。

1、3および4の端子のピン配置は、次の通りです。

信号 ピンNo.	カメラの同期モード		
	外部同期モード		内部同期モード (内部同期信号出力)
	HD、VD	S/VS/VBS	
1	アース	アース	アース
2	+12V	+12V	+12V
3	映像入力(アース)	映像入力(アース)	映像入力(アース)
4	映像入力(信号)	映像入力(信号)	映像入力(信号)
5	HD出力(アース)	——	内部HD入力(アース)
6	HD出力(信号)	——	内部HD入力(信号)
7	VD出力(信号)/トリガー出力	S/VS/VBS出力(信号)	内部VD入力(信号)
8	内部VD入力(アース)	内部VD入力(アース)	内部VD入力(アース)
9	内部VD入力(信号)/ 内部クロック入力*	内部VD入力(信号)/ 内部クロック入力*	VD入力(信号)/ クロック入力*
10	アース	アース	アース
11	+12V	+12V	+12V
12	VD出力(アース)	S/VS/VBS出力(アース)	内部VD入力(アース)

*ピンNo.9の入力信号は、DC-77RRのCLOCK OUT端子から出力されます。

後面


1 POWER ON/OFFスイッチとインジケーター
2 VIDEO OUT 1、2端子
3 EXT-SYNC H端子と75Ω終端スイッチ
4 CLOCK OUT端子
5 ～AC IN端子
6 EXT-SYNC V/RST端子と75Ω終端スイッチ
POWER
ON
OFF
VIDEO OUT
1
2
EXT-SYNC
H
ON
OFF
75Ω
V/RST
CLOCK OUT
～AC IN

1 POWER(電源)ON/OFFスイッチとインジケーター

ONにすると電源が入り、インジケーターが点灯します。

2 VIDEO OUT(映像信号出力) 1、2端子(BNC型)

カメラからの映像信号を出力します。

3 EXT-SYNC H(HD信号入出力)端子(BNC型)**と75Ω終端スイッチ**

外部HD信号の入出力またはXC-77RR/77RR-CE内部のHD信号の出力に使用します。どちらの信号を入出力するかは、接続したカメラで設定します。

外部HD信号の入出力に使用する場合は、1対のEXT-SYNC H端子の一方に、HD信号を入力します。入力されたHD信号は、そのままもう一方のEXT-SYNC H端子から出力されます。この出力信号を、さらに他の機器へ入力する場合は75Ω終端スイッチをOFFに設定します。HD信号を出力しない場合は75Ω終端スイッチをONに設定します。

XC-77RR/77RR-CE内部のHD信号を出力する場合、75Ω終端スイッチは必ずOFFに設定して下さい。

4 CLOCK OUT(クロック出力)端子(BNC型)

接続したカメラ内部で発生するクロック信号またはVD信号を出力します。どちらの信号を出力するかは、カメラで設定します。

5 ～AC IN(AC電源入力)端子

付属の電源コードを使用して、電源コンセントに接続します。

⑥ EXT-SYNC V/RST(VD信号/リセットパルス入出力)端子(BNC型)と75Ω終端スイッチ

外部のVD信号およびリセットパルスの入出力、またはXC-77RR/77RR-CE内部のVD信号の出力に使用します。どちらの信号を入出力するかは、接続したカメラで設定します。

外部VD信号の入出力に使用する場合は、1対のEXT-SYNC V/RST端子の一方に、VD信号を入力します。入力されたVD信号は、そのままもう一方のEXT-SYNC V/RST端子から出力されます。この出力信号をさらに他の機器へ入力する場合は75Ω終端スイッチをOFFに設定します。VD信号を出力しない場合は、75Ω終端スイッチをONに設定します。

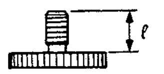
XC-77RR/77RR-CE内部のVD信号を出力する場合、75Ω終端スイッチは必ずOFFに設定して下さい。

1-4-3. 三脚アタッチメント VCT-77RR

三脚の取り付け部のネジは次の規格のものを使用してください。

ISO規格 ℓ＝4.5mm＋0.2mm

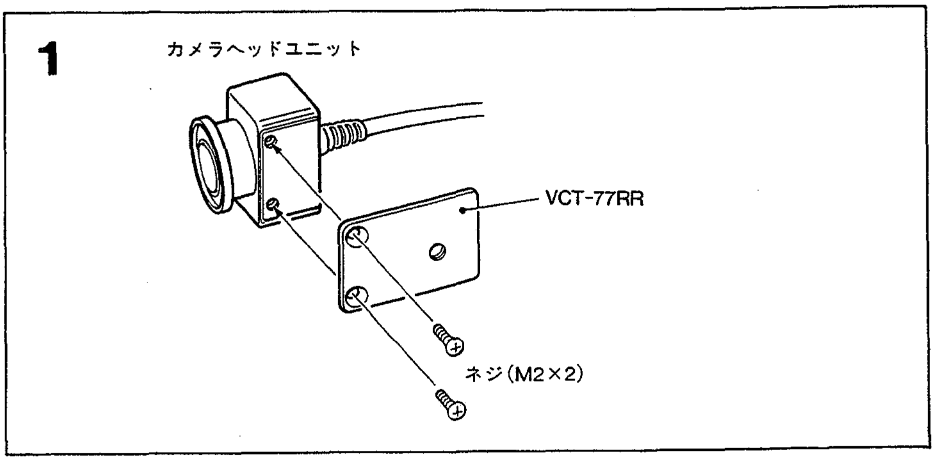
ASA規格 ℓ＝0.197インチ

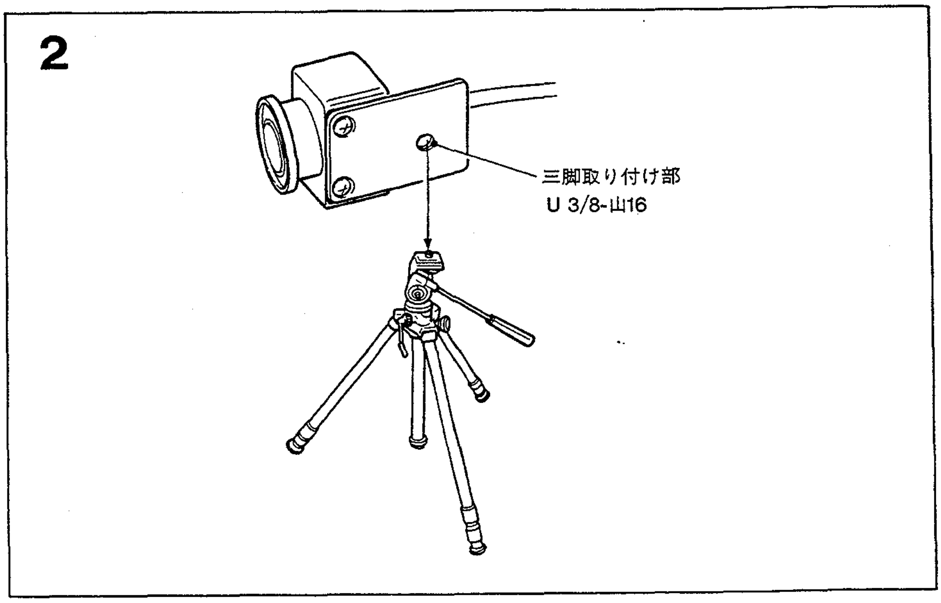


ご注意

三脚アタッチメントをCCDビデオカメラモジュールに取り付けるときは、長さ4mm以内のネジをご使用ください。ネジが長すぎると、カメラモジュール内の基板を傷付けるおそれがあります。

取り付けかた

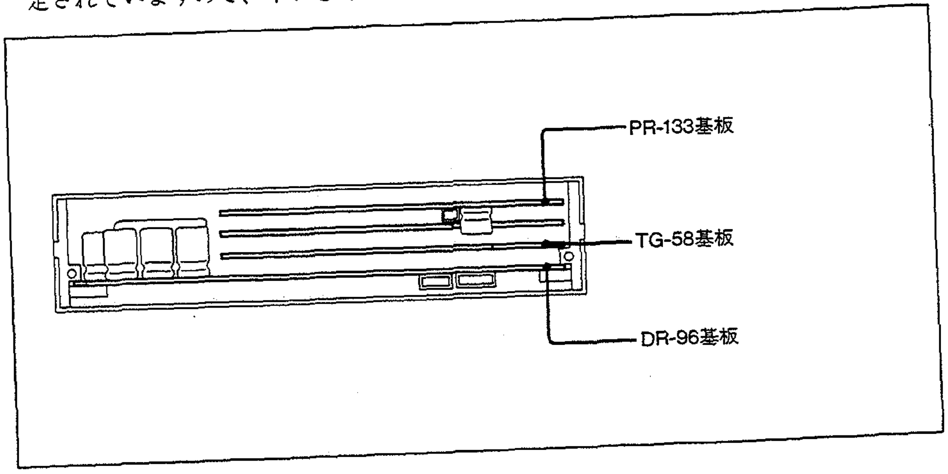

1
カメラヘッドユニット
VCT-77RR
ネジ（M2×2）


2
三脚取り付け部
U 3/8-山16

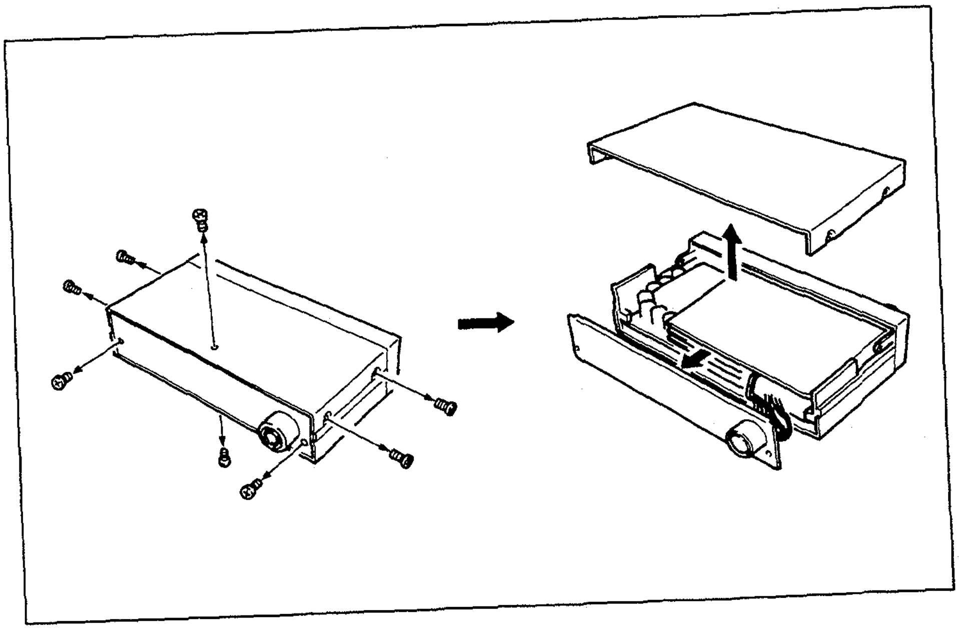
1-5. カメラコントロールユニットの内部スイッチの設定

ご注意

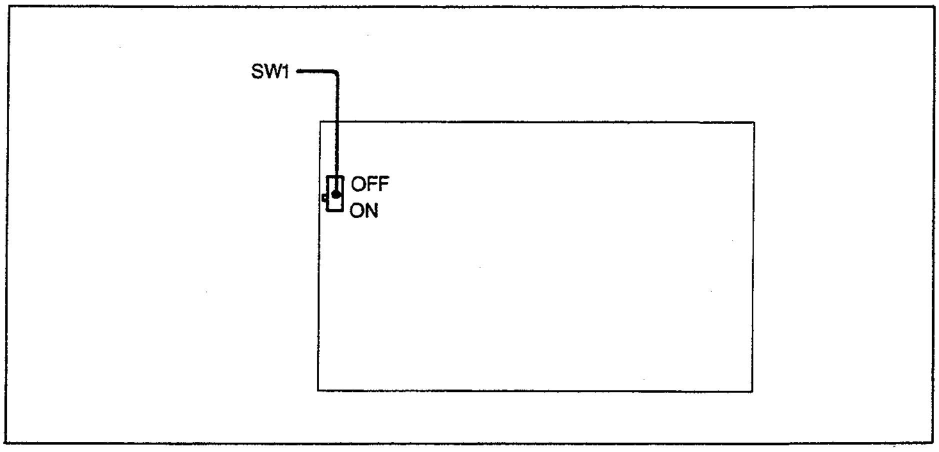
- 内部基板を取り出したり、内部基板上のスイッチを切り換えたりする前に、必ず電源を切ってください。電源を入れたまま基板やスイッチに触れると、本機を破損することがあります。
- DR-96基板を、カメラの底部から外さないでください。DR-96基板とカメラの底部は固定されていますので、ネジを外しただけでは取り外せません。



パネルの開けかた



PR-133基板



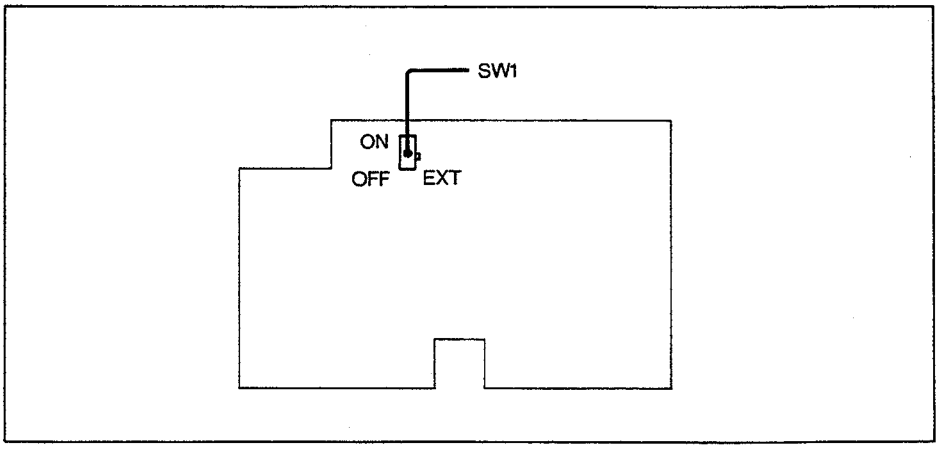
SW1(SYNC ON/OFFスイッチ)

カメラのDC IN/SYNC/VIDEO端子から出力する映像信号に、複合同期信号を付加するかしないかを切り換えます。

ON：通常の複合映像信号(映像信号と複合同期信号)を出力します。
　(工場出荷時の設定)

OFF：複合同期信号を出力しないで、映像信号のみを出力します。

TG-58基板



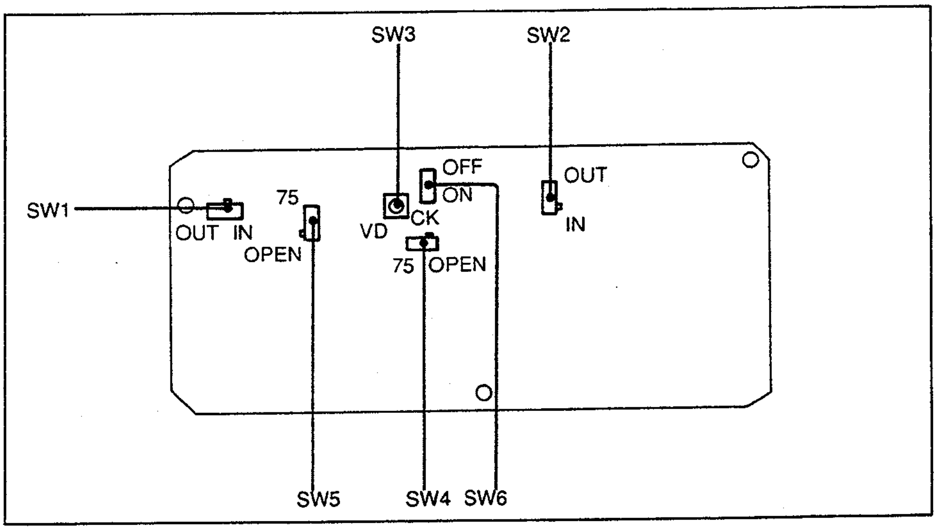
SW1[EXT HD(THROUGH OUT)/INT HD(SUB SG OUT)切り換えスイッチ]

リスタートリセットモード、DONPISHAシャッターモードまたは、ロングタームリセットモードに設定する場合、外部入力HD信号を使用して働かせるか、内部のHD信号を使用して働かせるかを切り換えます。

ON：外部入力HD信号

OFF：内部HD信号(工場出荷時の設定)

DR-96基板



SW1(EXT VD IN/INT VD OUTスイッチ)

接続したカメラアダプターDC-77RRのEXT-SYNC V/RST端子を外部VD信号入力端子として使用するか、カメラ内部のVD信号出力端子として使用するかを選択します。

OUT：EXT-SYNC V/RST端子を外部機器からのVD信号の入力端子として使用します。
(工場出荷時の設定)

IN：EXT SYNC V/RST端子をカメラ内部のVD信号出力端子として使用します。

SW2(EXT HD IN/INT HD OUTスイッチ)

接続したカメラアダプターDC-77RRのEXT-SYNC H端子を外部HD信号入力端子として使用するか、カメラ内部のHD信号出力端子として使用するかを選択します。

OUT：EXT-SYNC H端子を外部機器からのHD信号入力端子として使用します。(工場出荷時の設定)

IN：EXT SYNC H端子をカメラ内部のHD信号出力端子として使用します。

SW3(CLOCK OUT/INT VD OUTスイッチ)

接続したカメラアダプターDC-77RRのCLOCK OUT端子を内部クロック信号出力端子として使用するか、内部VD信号出力端子として使用するかを選択します。

CK：CLOCK OUT端子を内部クロック信号(XC-77RR：14.318182MHz、XC-77RR-CE：14.1875MHz)出力端子として使用します。なお、出力信号のレベルは、75Ω終端時で0.5Vp-p以上です。

VD：CLOCK OUT端子を、カメラ内部のVD信号出力端子として使用します。
(工場出荷時の設定)

SW4(EXT HD 75Ω ON/OFFスイッチ)

HD信号の75Ω終端スイッチです。接続したカメラアダプターを介して、カメラに外部HD信号を入力する場合に使用します。

75：HD信号を終端させる場合。

OPEN：HD信号をループスルーにして使用する場合。(工場出荷時の設定)

SW5(EXT VD 75Ω ON/OFFスイッチ)

VD信号の75Ω終端スイッチです。接続したカメラアダプターを介して、カメラに外部VD信号を入力する場合に使用します。

75：VD信号を終端させる場合。

OPEN：VD信号をループスルーにして使用する場合。(工場出荷時の設定)

SW6(L.T.R ON/OFFスイッチ)

カメラをロングタームリセットモード*にして使用する場合、このスイッチをONにします。このスイッチは、カメラの前面パネル内部のR/RSTスイッチの設定とは無関係に切り換わります。

工場出荷時の設定：OFF

* ロングタームリセットモード：間隔の長いリセットパルスによるリセットモードで、外部トリガー(リセットパルス)によって任意のタイミングで画像処理情報のための蓄積を開始します。蓄積時間は、外部トリガーパルスの入力幅によって決まります。

カメラアダプターDC-77RRを使用する場合のご注意

DC-77RRには、EXT-SYNC H、V/RST端子にそれぞれ75Ω終端スイッチが付いています。DC-77RRを介してカメラにHDまたはVD信号を入力する場合に、カメラ内部の75Ω終端スイッチとDC-77RRの75Ω終端スイッチを両方ともONにすると、入力信号の振幅が小さくなり外部同期がかからない場合があります。

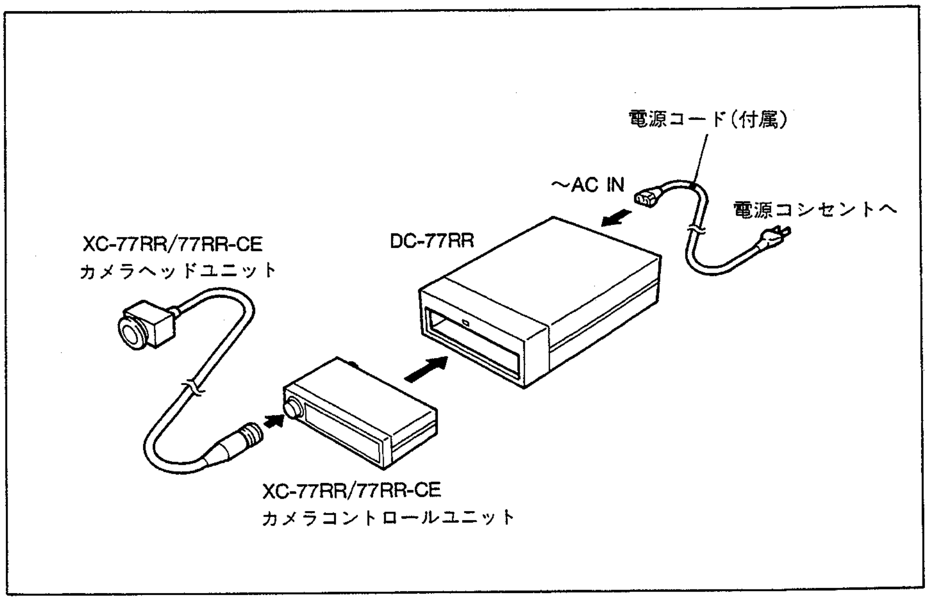
DC-77RRを使用する場合は、カメラ内部の75Ω終端スイッチはOFFに設定しておいて、DC-77RRの75Ω終端スイッチでON/OFFさせてください。

1-6. 接続

1-6-1. 接続する前に

- 接続する機器の電源を切ってください。電源を入れたまま接続すると、内部の素子が破損するおそれがあります。
- コネクターを抜くときは、必ずプラグ部分を持って抜いてください。ケーブルを引っ張ると断線などの原因となります。
- 安全のため、電源コードはすべての接続がすんでからつないでください。

1-6-2. XC-77RR/77RR-CEをDC-77RRに組み込んで使用する場合

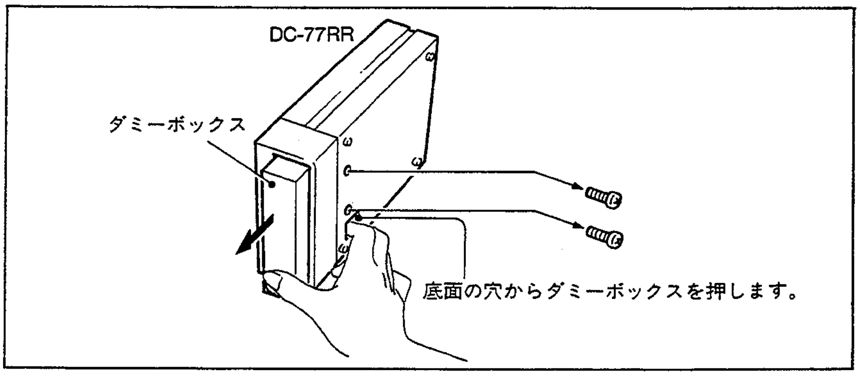

電源コード(付属)
~AC IN
電源コンセントへ
XC-77RR/77RR-CE
カメラヘッドユニット
DC-77RR
XC-77RR/77RR-CE
カメラコントロールユニット

XC-77RR/77RR-CEのカメラヘッドユニットとカメラコントロールユニットの間は5mですが、これ以上延長する場合は延長ケーブルCCXC-20P20(20m)を使用してください。

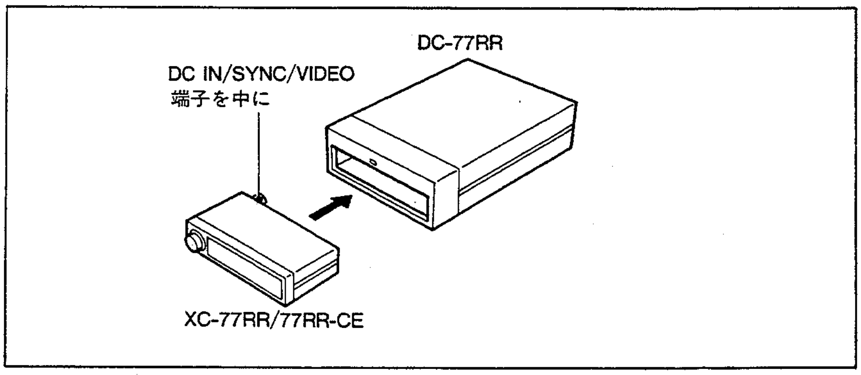
DC-77RRへの組み込みかた

DC-77RRからダミーボックスを取り出し、代わりにXC-77RR/77RR-CEのカメラコントロールユニットを組み込みます。

1 DC-77RRの底面の2本の固定ネジを外し、底面の穴からダミーボックスを押します。

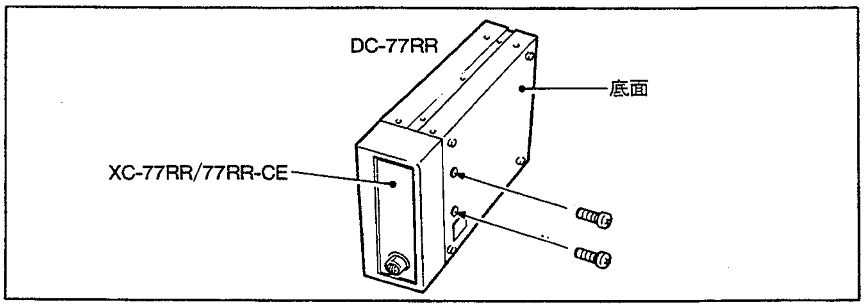

DC-77RR
ダミーボックス
底面の穴からダミーボックスを押します。

2 DC IN/SYNC/VIDEO端子を中にして、XC-77RR/77RR-CEをDC-77RRに組み込みます。


DC-77RR
DC IN/SYNC/VIDEO
端子を中に
XC-77RR/77RR-CE

XC-77RR/77RR-CEのDC IN/SYNC/VIDEO端子が、DC-77RRのカメラ接続用端子に差し込まれるように、しっかりと組み込んでください。

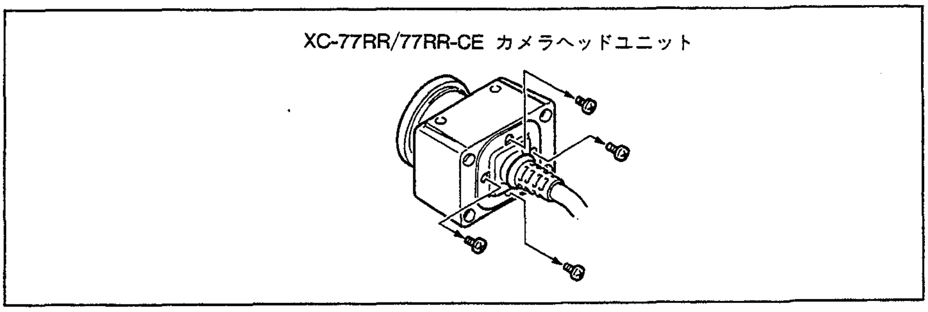
3 DC-77RRとXC-77RR/77RR-CEとをネジで固定します。


DC-77RR
底面
XC-77RR/77RR-CE

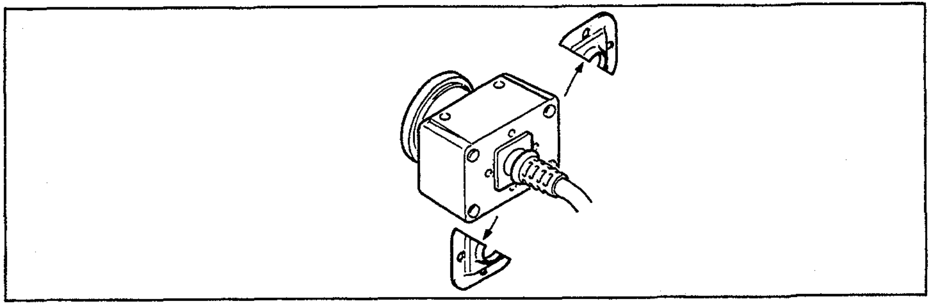
カメラヘッドユニットのケーブルの向きを変えるには

付属のケーブル横出し金具を使用して、カメラヘッドユニットのケーブルの向きを上下左右に変えることができます。

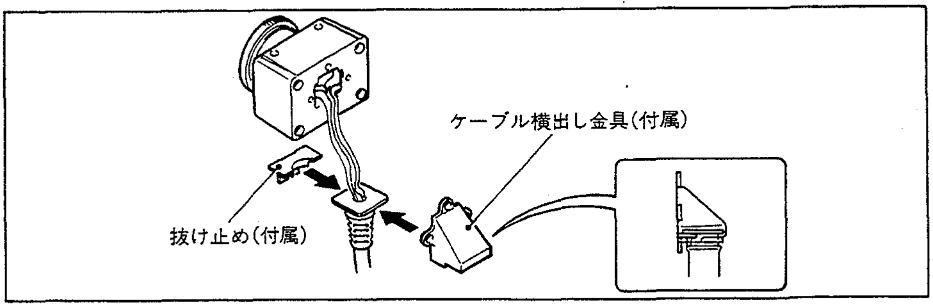
1


XC-77RR/77RR-CE カメラヘッドユニット

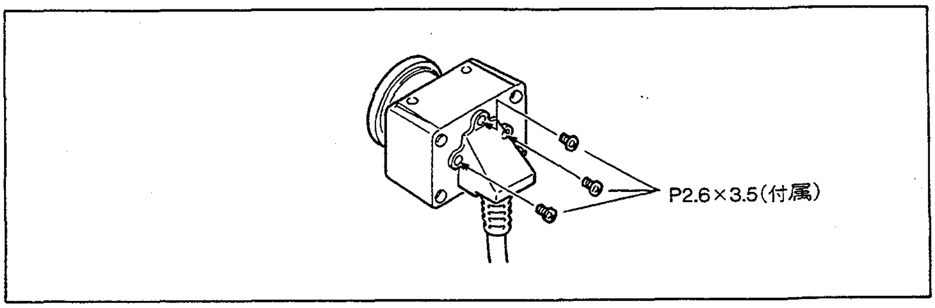
2



3


ケーブル横出し金具(付属)
抜け止め(付属)

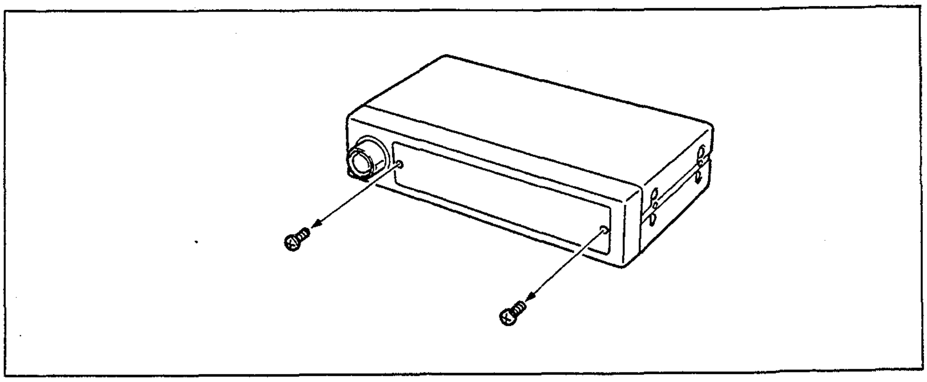
4



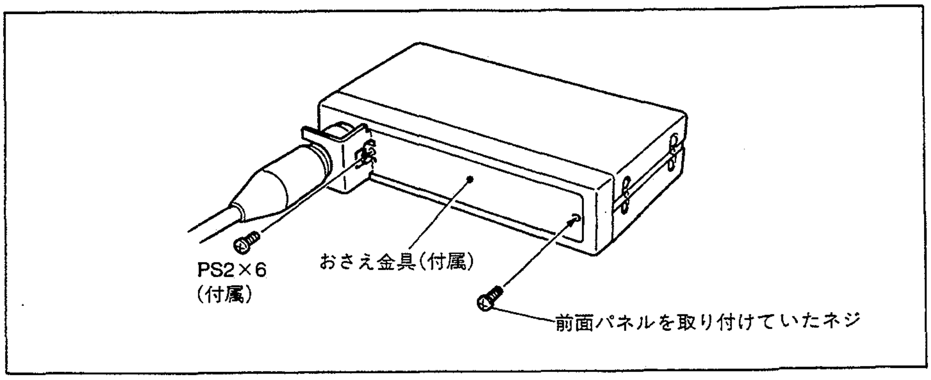
カメラヘッド接続用端子とカメラケーブルとを固定するには

カメラコントロールユニットに強い振動が加わる状態で使用すると、画面によこすじが出ることがあります。このような場合は、付属のおさえ金具を使用して、CAMERA HEAD接続用端子とカメラケーブルを固定してください。

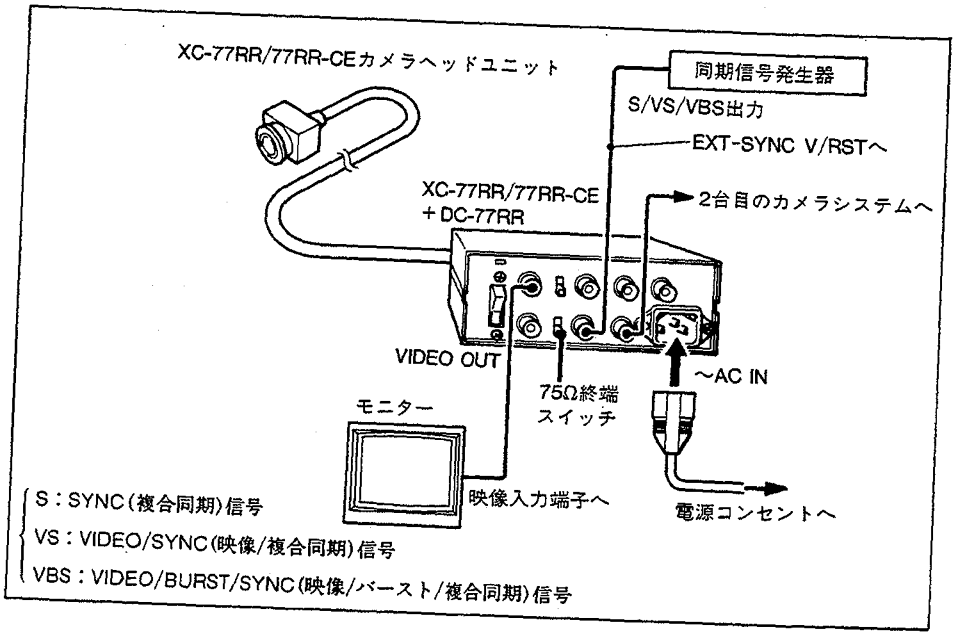
1 前面パネルを外します。



2 おさえ金具を取り付けます。


PS2×6
（付属）
おさえ金具（付属）
前面パネルを取り付けていたネジ

1-6-3. S/VS/VBSのいずれかの信号で外部同期を行う場合


XC-77RR/77RR-CEカメラヘッドユニット
同期信号発生器
S/VS/VBS出力
EXT-SYNC V/RSTへ
XC-77RR/77RR-CE
+DC-77RR
2台目のカメラシステムへ
VIDEO OUT
75Ω終端
スイッチ
~AC IN
モニター
映像入力端子へ
電源コンセントへ
S：SYNC（複合同期）信号
VS：VIDEO/SYNC（映像/複合同期）信号
VBS：VIDEO/BURST/SYNC（映像/バースト/複合同期）信号

ループスルー出力について

DC-77RRには、2つのEXT-SYNC V/RST端子がありますが、これらの端子のどちらを使用してもかまいません。どちらか一方に信号を入力すると、他方はその入力信号のスルーアウト用の出力端子となります。
スルーアウト用の出力端子を使用しない場合は75Ω終端スイッチをONに、使用する場合はOFFに設定します。

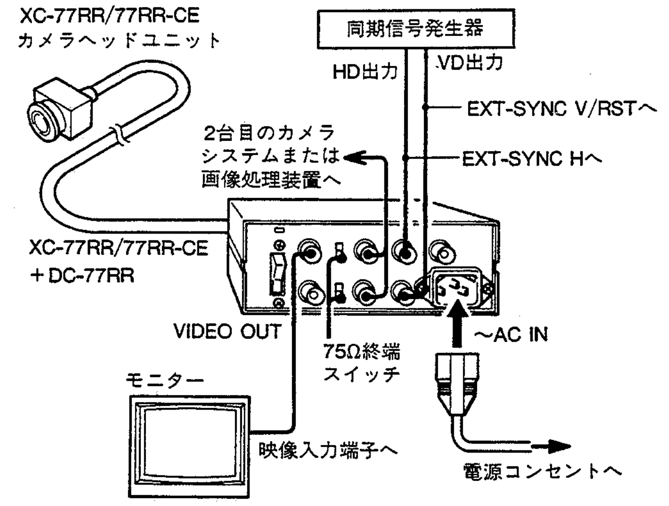
75Ω終端スイッチについて

EXT-SYNC V/RST端子の75Ω終端スイッチは、XC-77RR/77RR-CEのカメラコントロールユニット内部のDR-96基板と、カメラアダプターDC-77RRのコネクターパネル上の2か所にあります。
2つの75Ω終端スイッチは、同等の機能を持ちます。XC-77RR/77RR-CEのスイッチは、内部基板上にあるので操作がしにくいため、常時OFFに設定しておき（工場出荷時の設定）、DC-77RRの75Ω終端スイッチを使用して終端することをお薦めします。

ご注意

XC-77RR/77RR-CEとDC-77RRの両方の75Ω終端スイッチをONにすると、入力信号の振幅が小さくなり、外部同期がかからなくなる場合があります。

1-6-4. HDおよびVD信号で外部同期を行う場合


XC-77RR/77RR-CE
カメラヘッドユニット
同期信号発生器
HD出力
VD出力
EXT-SYNC V/RSTへ
EXT-SYNC Hへ
2台目のカメラ
システムまたは
画像処理装置へ
XC-77RR/77RR-CE
＋DC-77RR
VIDEO OUT
75Ω終端
スイッチ
~AC IN
モニター
映像入力端子へ
電源コンセントへ

HD：Horizontal Drive(水平駆動)信号
VD：Vertical Drive(垂直駆動)信号

ループスルー出力について

DC-77RRには、EXT-SYNC V/RST端子とEXT-SYNC H端子がそれぞれ2つずつあります。これらの端子は、どちらを使用して信号を入力してもかまいません。どちらか一方に信号を入力すると、他方はその入力信号のスルーアウト用の出力端子となります。スルーアウト用の出力端子を使用しない場合は75Ω終端スイッチをONに、使用する場合はOFFに設定します。

75Ω終端スイッチについて

EXT-SYNC V/RSTおよびH端子の75Ω終端スイッチは、XC-77RR/77RR-CEのカメラコントロールユニット内部のDR-96基板と、カメラアダプターDC-77RRのコネクターパネル上の2か所にあります。

2つの75Ω終端スイッチは、同等の機能を持ちますが、XC-77RR/77RR-CEのスイッチは内部基板上にあるため、操作がしにくいのでOFFに設定しておき(工場出荷時の設定)、DC-77RRの75Ω終端スイッチで操作することをお薦めします。

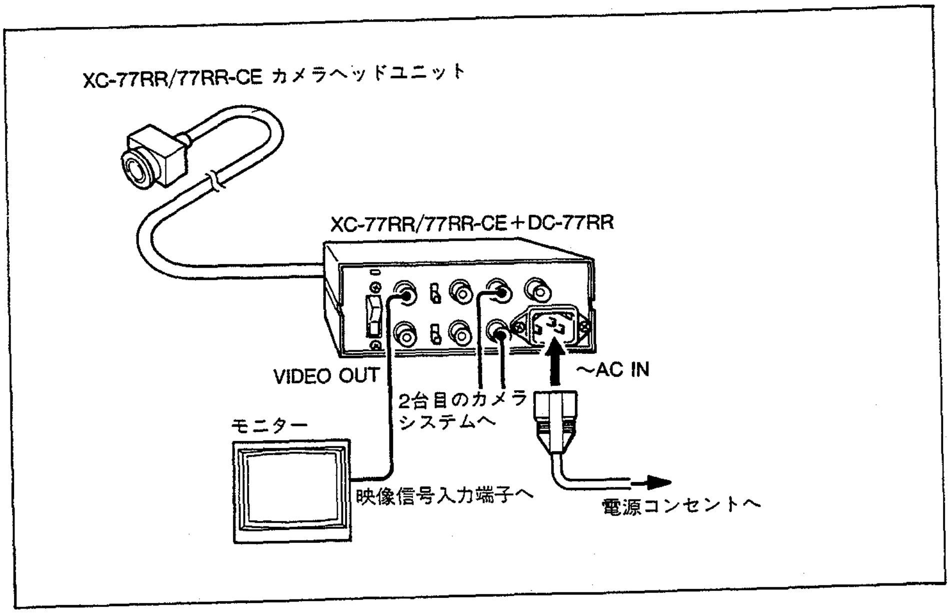
ご注意

XC-77RR/77RR-CEとDC-77RRの両方の75Ω終端スイッチをONにすると、入力信号が小さくなり、外部同期がかからなくなることがあります。

1. 取り扱い操作

1-6-5. XC-77RR/77RR-CE内部の同期信号を使用して他のカメラを同期させる場合

XC-77RR/77RR-CEから、内部の同期信号(内部クロック、HDまたはVD信号)を出力する場合は、カメラ内部のスイッチで出力信号を設定する必要があります。
詳しくは、「1-5. カメラコントロールユニットの内部スイッチの設定」の項をご覧ください。尚、XC-77RR/77RR-CE内部から出力される同期信号は、TTLレベル出力となっていますので、75Ω終端スイッチは必ずOFFに設定して下さい。

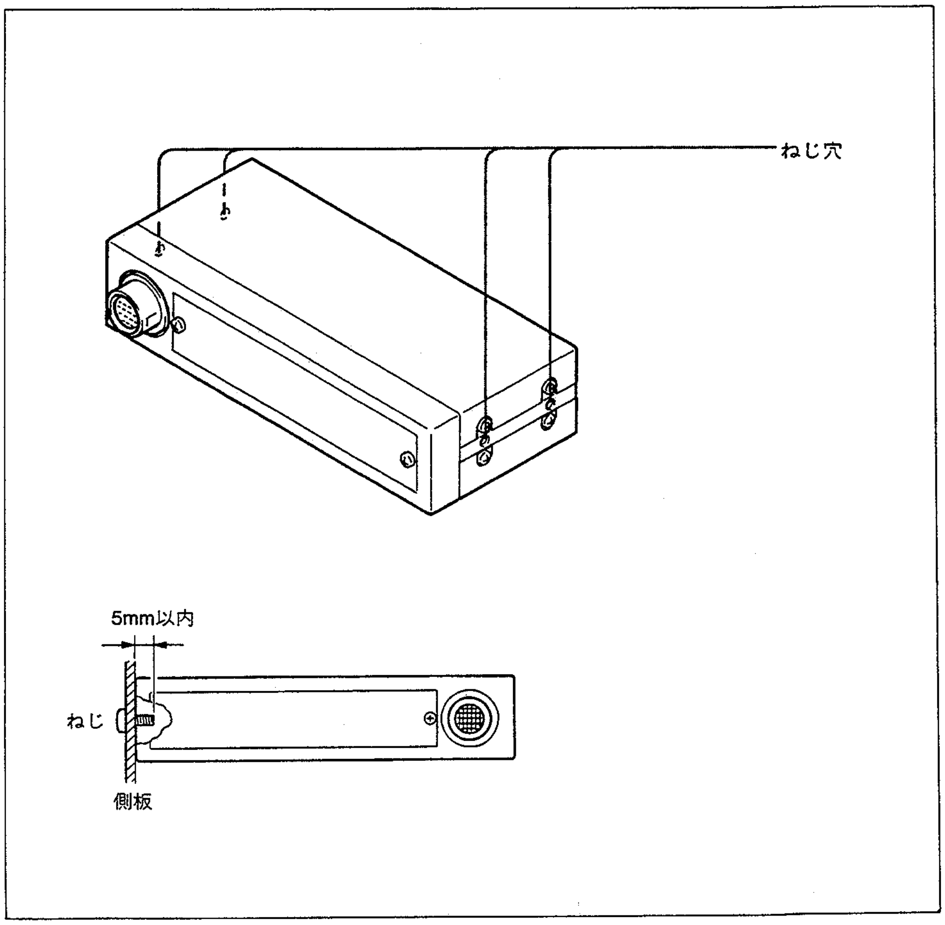

XC-77RR/77RR-CE カメラヘッドユニット
XC-77RR/77RR-CE＋DC-77RR
VIDEO OUT
〜AC IN
2台目のカメラシステムへ
モニター
映像信号入力端子へ
電源コンセントへ

1-6-6. 付属のねじについて

付属のねじは以下の用途に使用してください。

- 横出し金具の取り付け
  精密(1)種+P2.6×3.5ねじ(黒)　3本
- カメラヘッド(CAMERA HEAD)接続端子用振動おさえ金具の取り付け
  +PS2×6ねじ(黒)　1本

1-6-7. 側板など取り付けるときに使用するねじの長さについて

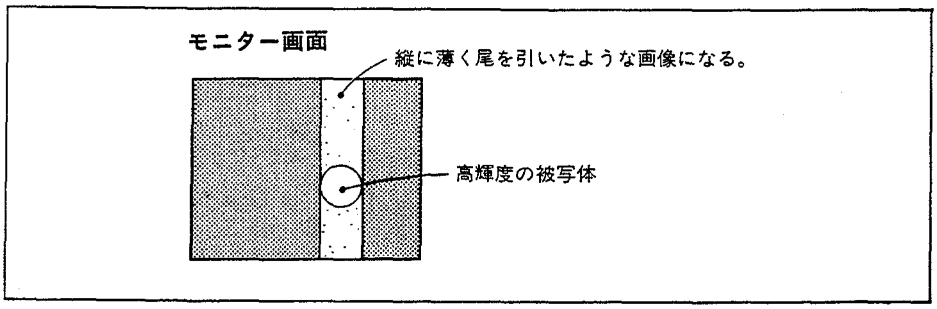


ねじは、側板を通して取り付けたときに、ねじ穴に5mm以上入らない長さのものを使用してください。長すぎるねじを使用すると、内部を損傷するおそれがあります。

1-7. CCD特有の現象

スミア現象

高輝度の被写体(電灯、蛍光灯、太陽、強い反射光など）を写したときに起こる現象。


モニター画面
縦に薄く尾を引いたような画像になる。
高輝度の被写体

この現象は、CCDが下の図のようなインターライン転送方式を採用しているため、フォトセンサーの深いところに入った赤外線などにより誘起された電荷が、レジスターに転送されるために起こるものです。

折り返しひずみ

縞模様、線などを写すと、ギザギザに見えることがあります。

傷

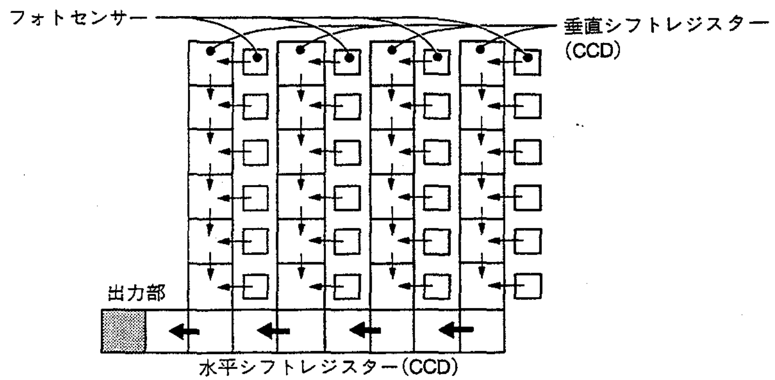
CCDはフォトセンサー(素子)が縦横に並んでできており、フォトセンサーのいずれかに欠陥があると、その部分だけ画像が写らず、モニター画面上に傷となってみえます(実用上支障がない程度)。

微小白点

高温時および長時間蓄積時に、暗い被写体を写している場合、画面全体に多数の白点が現れることがあります。

CCDインターライン転送方式

本機が採用しているインターライン転送方式は、CCD上に結んだ像の明暗に対応した電荷を、順次転送して行くものです。下図のように、フォトセンサーで検知した被写体の明暗に対応した電荷は、まず、それぞれ隣の垂直シフトレジスターに転送されます。垂直シフトレジスターに移った電荷は、垂直方向に順次転送され、、水平シフトレジスターへ送られます。水平シフトレジスターに移った電荷は、水平方向に順次転送され、出力部から出力されます。


フォトセンサー
垂直シフトレジスター
(CCD)
出力部
水平シフトレジスター(CCD)

第2章
製品規格

2-1．主な仕様

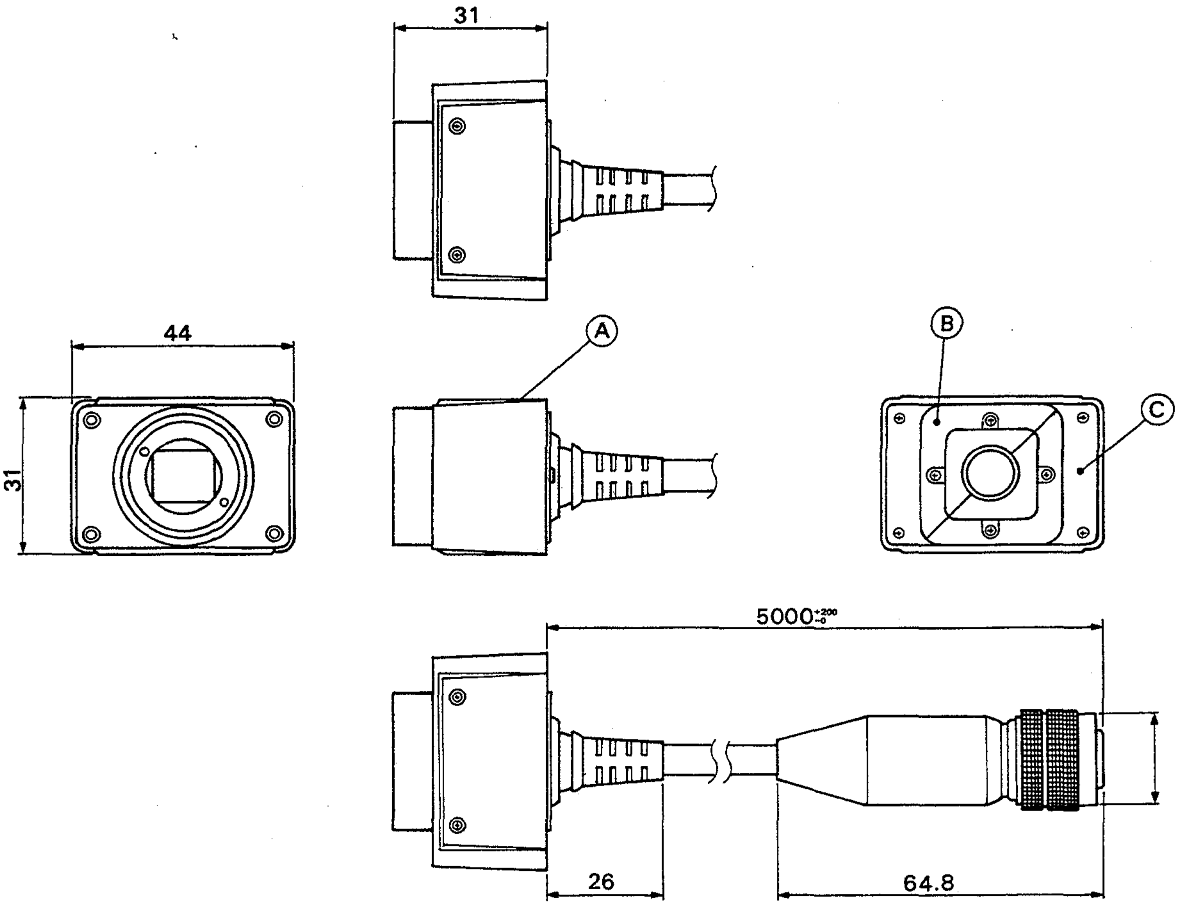
〈CCDビデオカメラモジュール　XC-77RR〉

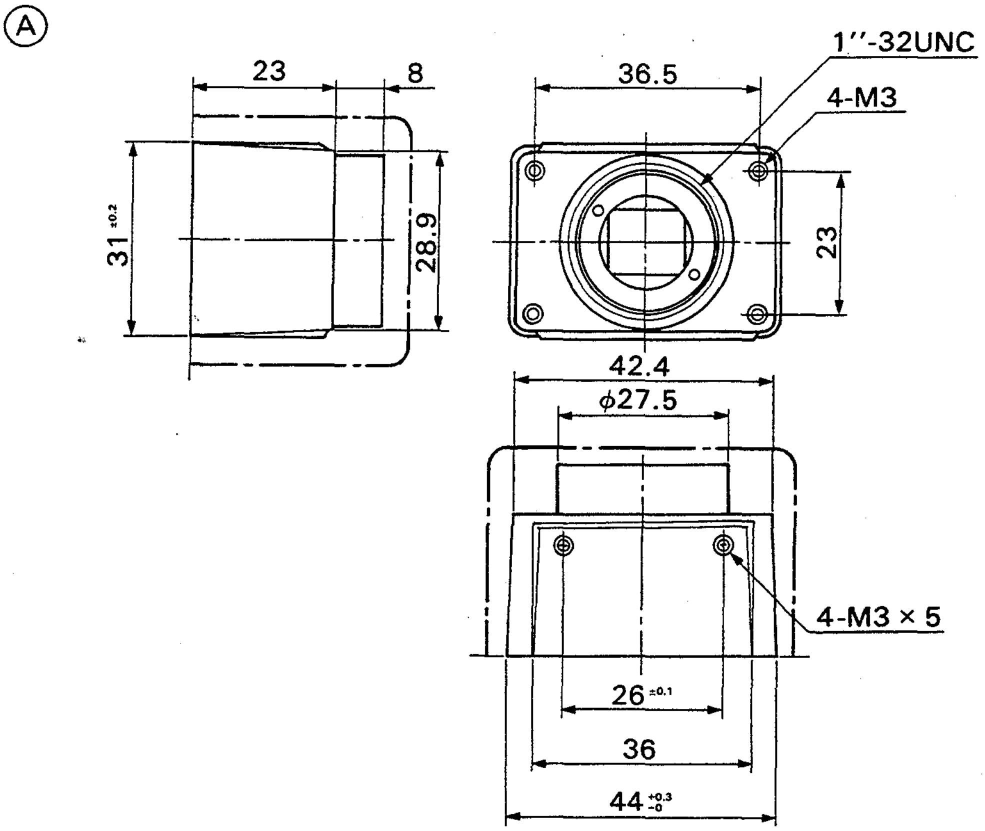
撮像素子	インターライン転送方式CCD
有効画素数	768×493(水平/垂直)
撮像面積	8.8mm×6.6mm(2/3インチサイズ)
光学黒期間	各水平走査線のうち50画素
CCD垂直駆動周波数	15.734KHz±1%
CCD水平駆動周波数	14.318MHz
信号方式	EIA方式
セルサイズ	11×13μm(水平/垂直)
チップサイズ	10.0×8.2mm(水平/垂直)

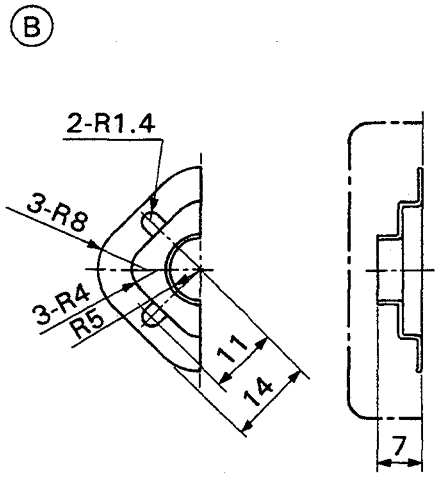
光学系，その他	
レンズマウント	Cマウント
フランジバック	17.526mm
同期方式	内部/外部(内部スイッチ切り替え)
外部同期入力	S/VBS/VS (SYNC レベル 0.3Vp-p±6dB) HD，VD (信号レベル 2～5Vp-p)
外部同期許容周波数偏差	±1%(水平同期周波数に対して)
ジッター	±50nsec以内
走査方式	525本 2:1インターレース/ノンインターレース (内部スイッチ切り換え)
映像出力	1.0Vp-p同期負，75Ω不平衡
水平解像度	570 TV本
垂直有効ライン数	485本(2：1インターレース時)
感度	400 lux, F4(ガンマ補正ON, 0dB)
最低被写体照度	5.0 lux (AGC：ON, F1.4, ガンマ補正ON)
映像S/N比	56dB
ゲイン	オートゲインコントロール/固定ゲイン (スイッチ切り換え)
ガンマ	ガンマ補正/ガンマ＝1 (スイッチ切り換え)

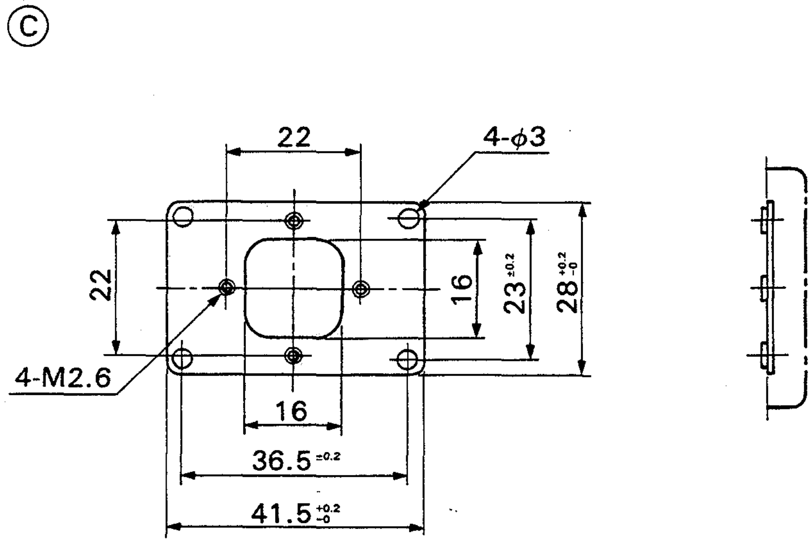
ホワイトクリップ	110 IRE±10 IRE/140 IRE±10 IRE (スイッチ切り換え)
蓄積モード	フレーム/フィールド (スイッチ切り換え)
シャッター機能	ノーマルシャッター/DONPISHA シャッター(スイッチ切り換え)
シャッタースピード	
ノーマルシャッター	1/63～1/3,580,000秒
DONPISHAシャッター	1/3.6～1/2200秒
電源電圧	DC 12V
電圧範囲	DC 10.5V～15V
消費電力	5.5W
動作温度	−5℃～45℃
保存温度	−25℃～＋60℃
使用湿度	20～80%（結露のない状態で）
保存湿度	20～95%（結露のない状態で）
耐衝撃性	70G
耐振動性	7G
外形寸法	
カメラヘッドユニット	44×31×23mm(幅/高さ/奥行き) (ケーブルを除く)
カメラコントロールユニット	135×30×70mm(幅/高さ/奥行き)
重量	
カメラヘッドユニット	400g(ケーブルを含む)
カメラコントロールユニット	370g
付属品	レンズマウントキャップ（1） ケーブル横出し金具（1式） 抜け止め（1） おさえ金具（1式） 取扱説明書（1）

寸法：(単位：mm)
　カメラモジュール〈XC-77RR〉
　　カメラヘッドユニット

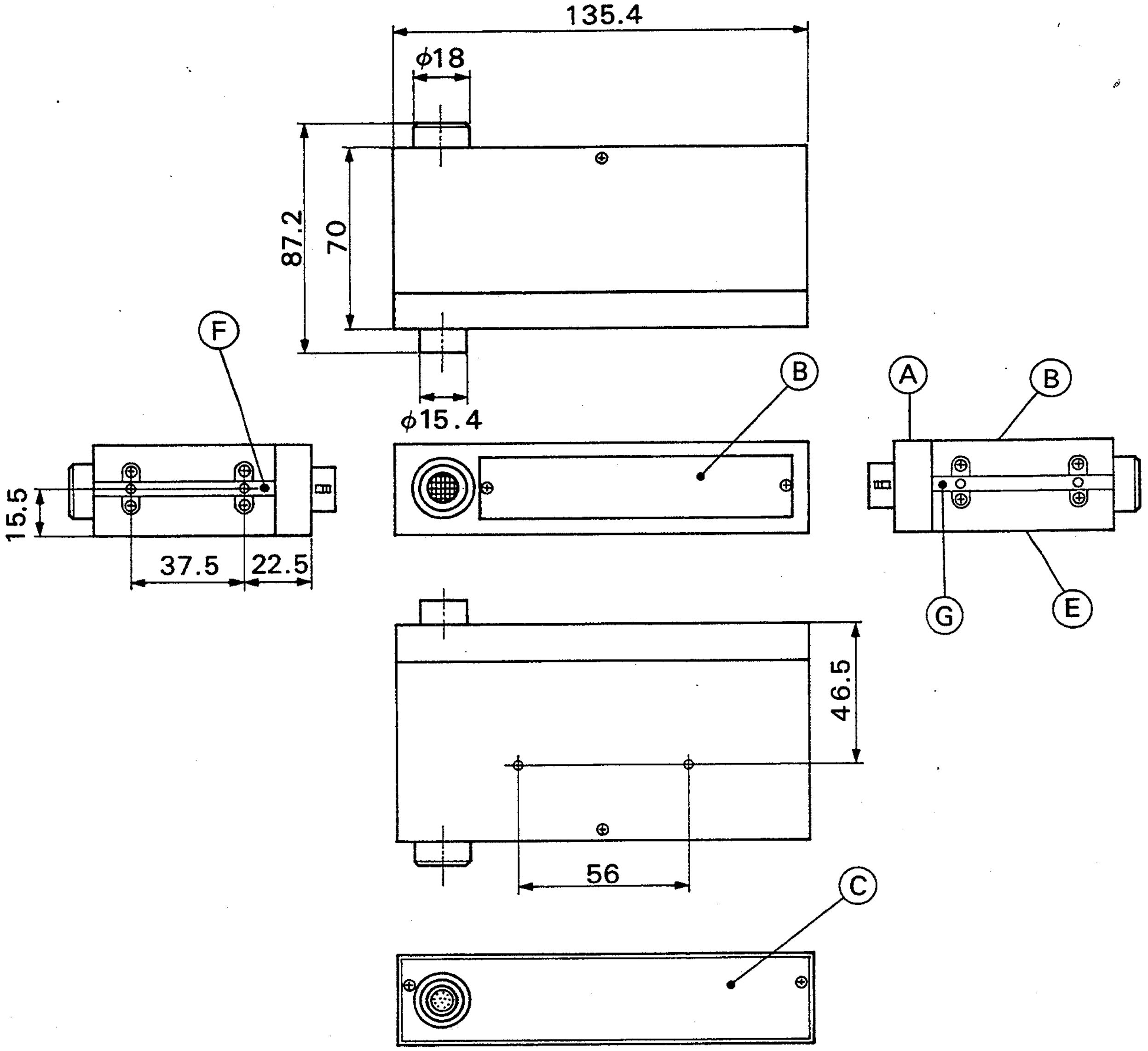

31
44
31
Ⓐ
Ⓑ
Ⓒ
5000^{+200}_{-0}
26
64.8

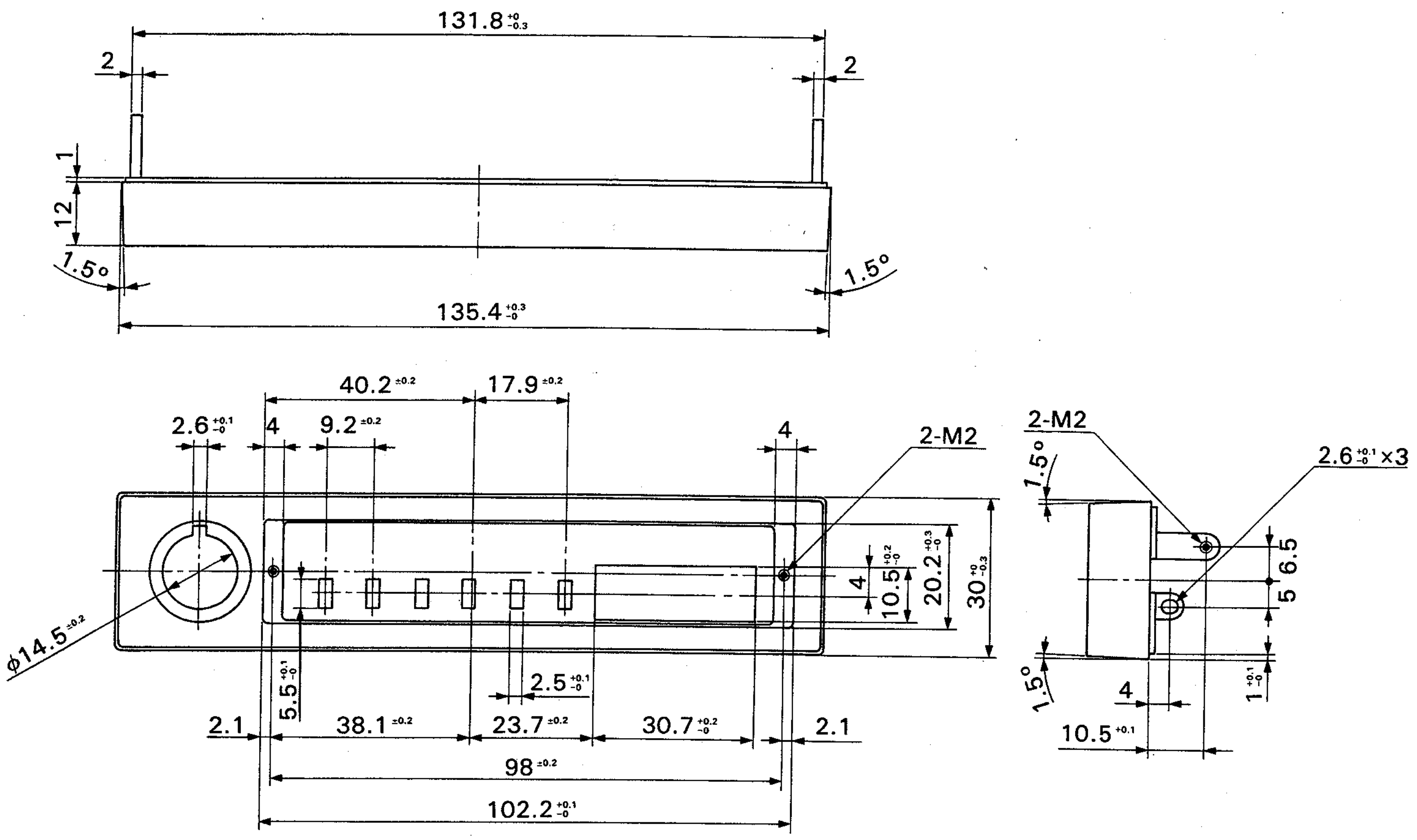

Ⓐ
23
8
31 ±0.2
28.9
36.5
1″-32UNC
4-M3
23
42.4
ϕ27.5
4-M3 × 5
26 ±0.1
36
44 +0.3 -0


Ⓑ
2-R1.4
3-R8
3-R4
R5
11
14
7

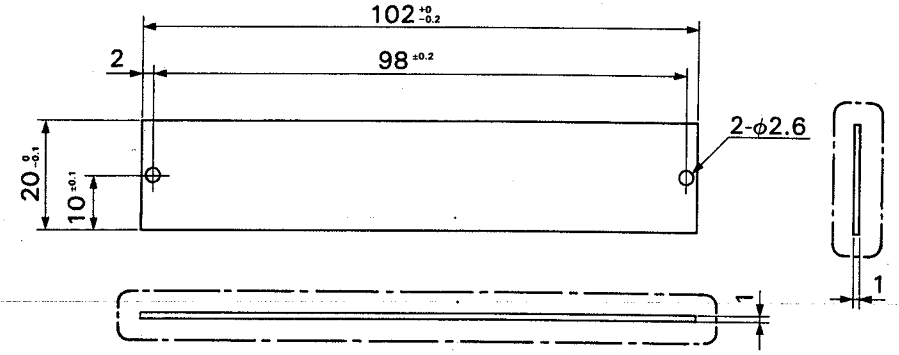

Ⓒ
22
4-ϕ3
22
16
23 ±0.2
28 +0.2 -0
4-M2.6
16
36.5 ±0.2
41.5 +0.2 -0

カメラコントロールユニット

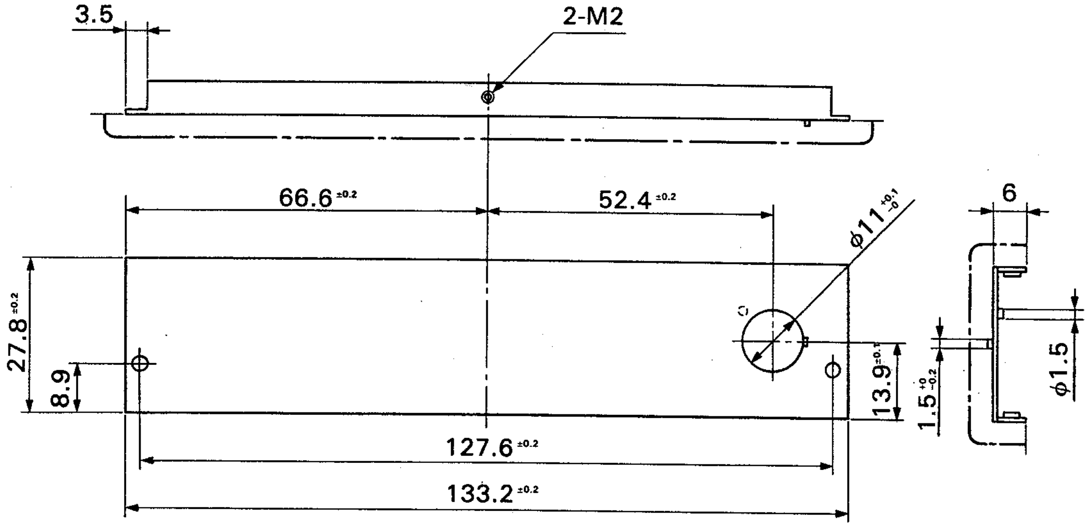

135.4
φ18
87.2
70
φ15.4
15.5
37.5
22.5
46.5
56
A
B
C
E
F
G


131.8 +0 -0.3
2
2
1
12
1.5°
1.5°
135.4 +0.3 -0
40.2 ±0.2
17.9 ±0.2
2.6 +0.1 -0
4
9.2 ±0.2
4
2-M2
φ14.5 ±0.2
4
10.5 +0.2 -0
20.2 +0.3 -0
30 +0 -0.3
5.5 +0.1 -0
2.5 +0.1 -0
2.1
38.1 ±0.2
23.7 ±0.2
30.7 +0.2 -0
2.1
98 ±0.2
102.2 +0.1 -0
2-M2
1.5°
2.6 +0.1 -0 ×3
6.5
5
1 +0.1 -0
1.5°
4
10.5 +0.1

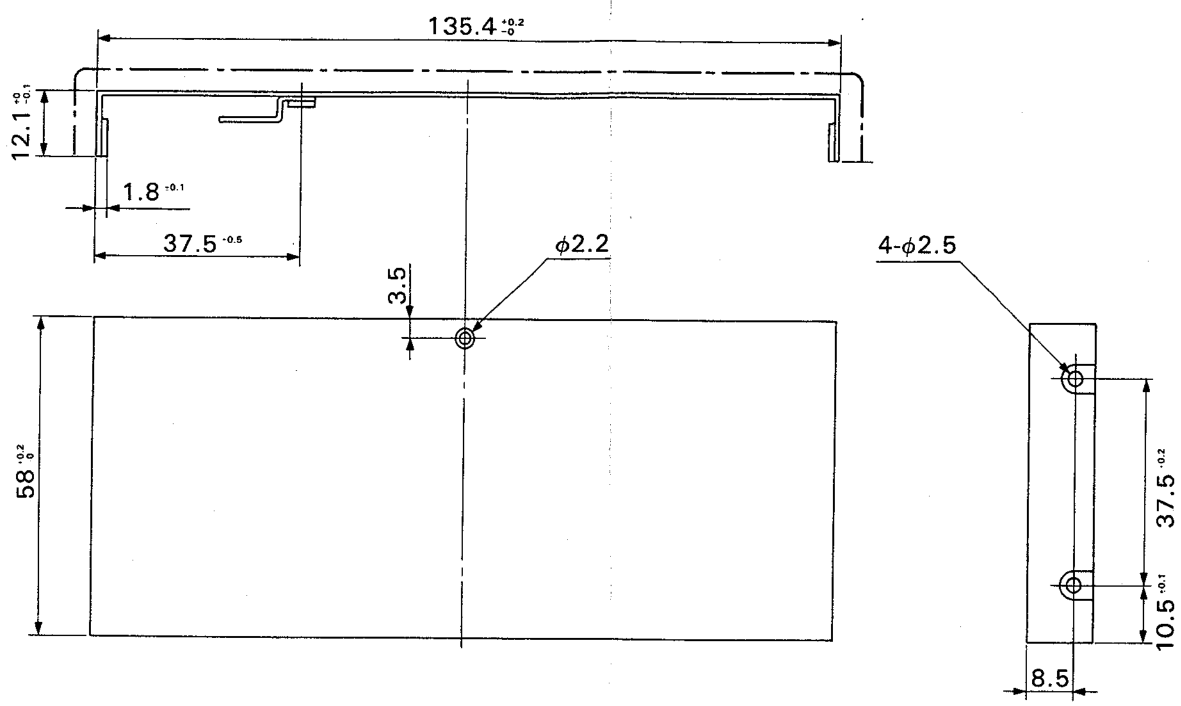
Ⓑ


102 +0 -0.2
2
98 ±0.2
2-φ2.6
20 0 -0.1
10 ±0.1
1
1

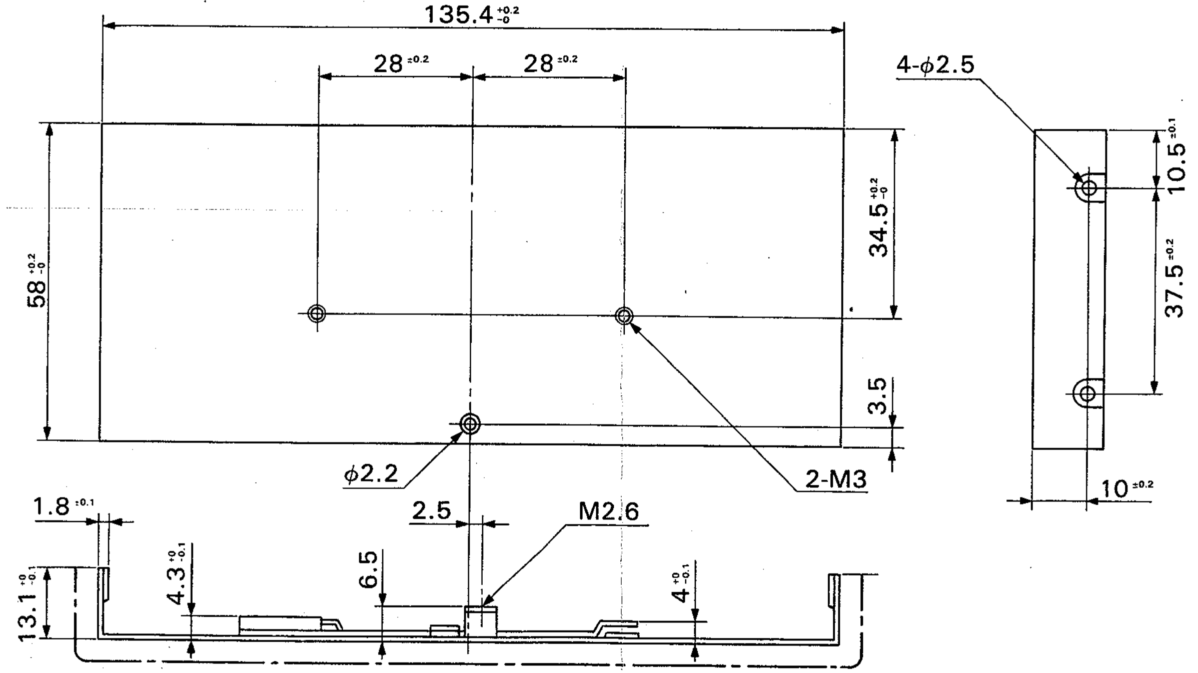
Ⓒ


3.5
2-M2
66.6 ±0.2
52.4 ±0.2
φ11 +0.1 -0
6
27.8 ±0.2
8.9
13.9 +0.1 -0
1.5 +0 -0.2
φ1.5
127.6 ±0.2
133.2 ±0.2

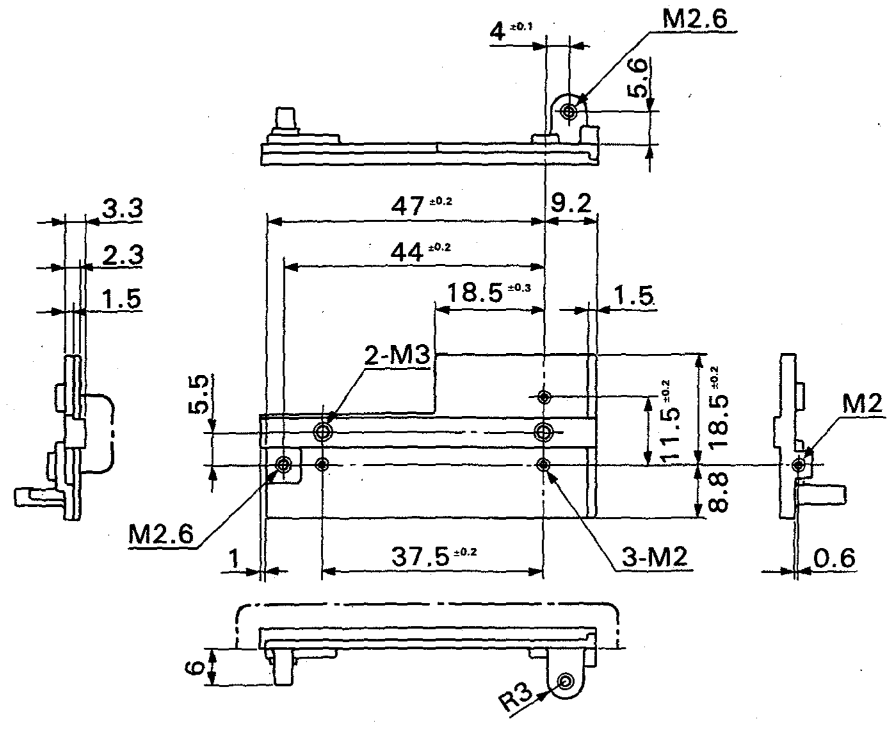
Ⓓ


135.4 +0.2 -0
12.1 +0 -0.1
1.8 -0.1
37.5 -0.5
3.5
φ2.2
4-φ2.5
58 +0.2 -0
37.5 -0.2
10.5 -0.1
8.5

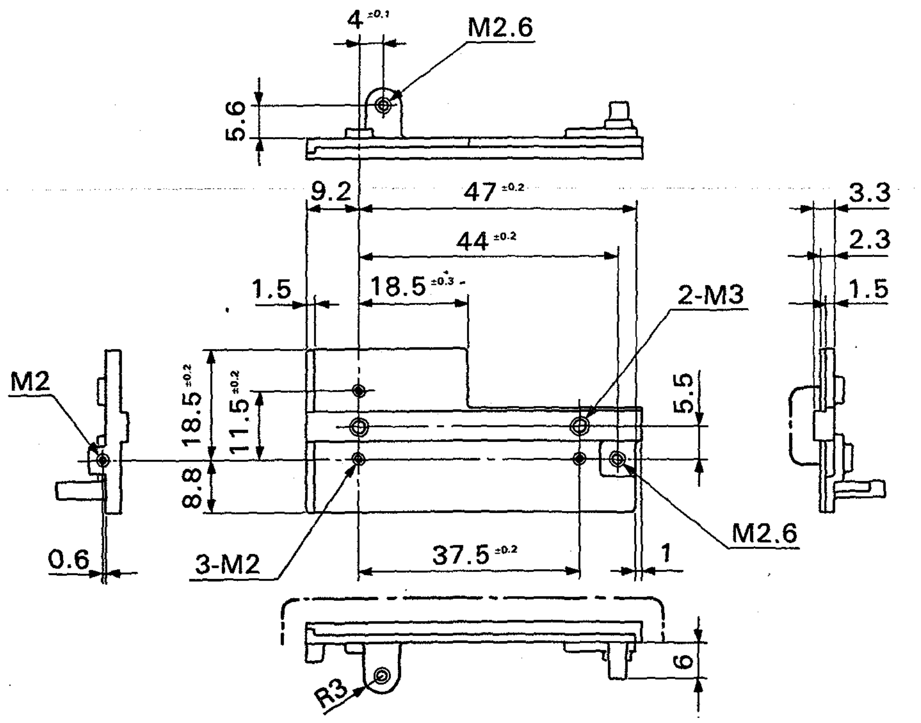
Ⓔ


135.4 +0.2 -0
28 ±0.2
28 ±0.2
4-φ2.5
10.5 +0.1
34.5 +0.2 -0
58 +0.2 -0
37.5 +0.2
3.5
φ2.2
2-M3
10 ±0.2
1.8 ±0.1
2.5
M2.6
13.1 +0 -0.1
4.3 +0 -0.1
6.5
4 +0 -0.1

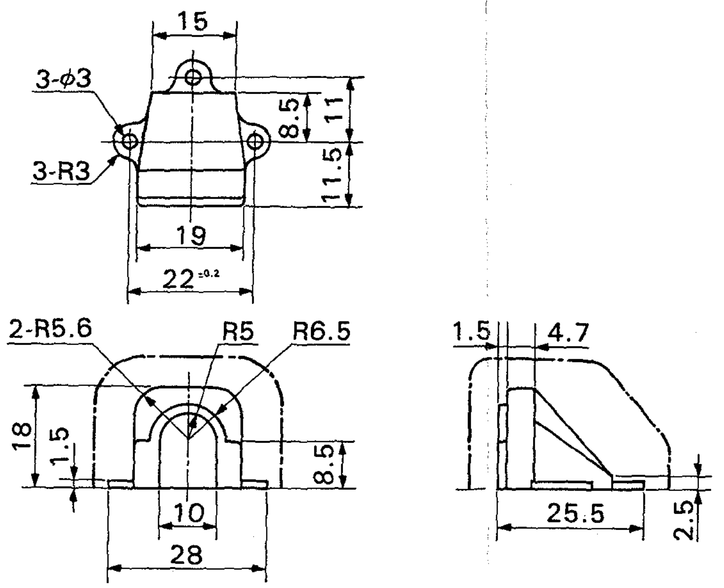
Ⓕ


4 ±0.1
M2.6
5.6
3.3
2.3
1.5
47 ±0.2
9.2
44 ±0.2
18.5 ±0.3
1.5
2-M3
5.5
11.5 ±0.2
18.5 ±0.2
8.8
M2
M2.6
1
37.5 ±0.2
3-M2
0.6
6
R3

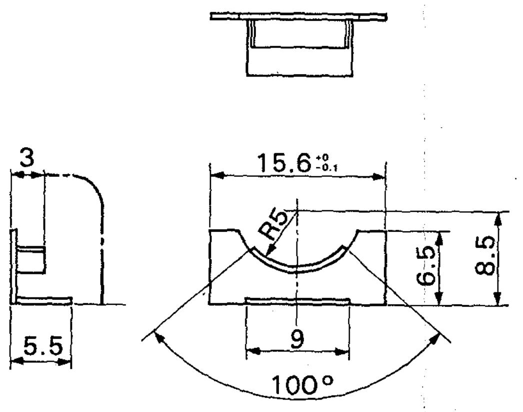
Ⓖ


4 ±0.1
M2.6
5.6
9.2
47 ±0.2
3.3
44 ±0.2
2.3
1.5
18.5 ±0.3
2-M3
1.5
M2
18.5 ±0.2
11.5 ±0.2
5.5
8.8
M2.6
0.6
3-M2
37.5 ±0.2
1
R3
6

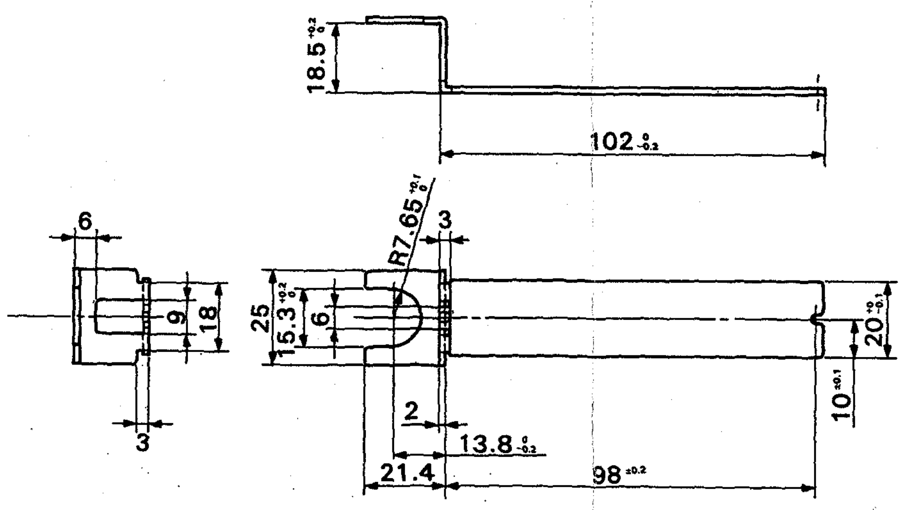
ケーブル横出し金具


15
3-φ3
8.5
11
3-R3
11.5
19
22 ±0.2
2-R5.6
R5
R6.5
1.5
4.7
18
1.5
8.5
10
28
25.5
2.5

抜け止め

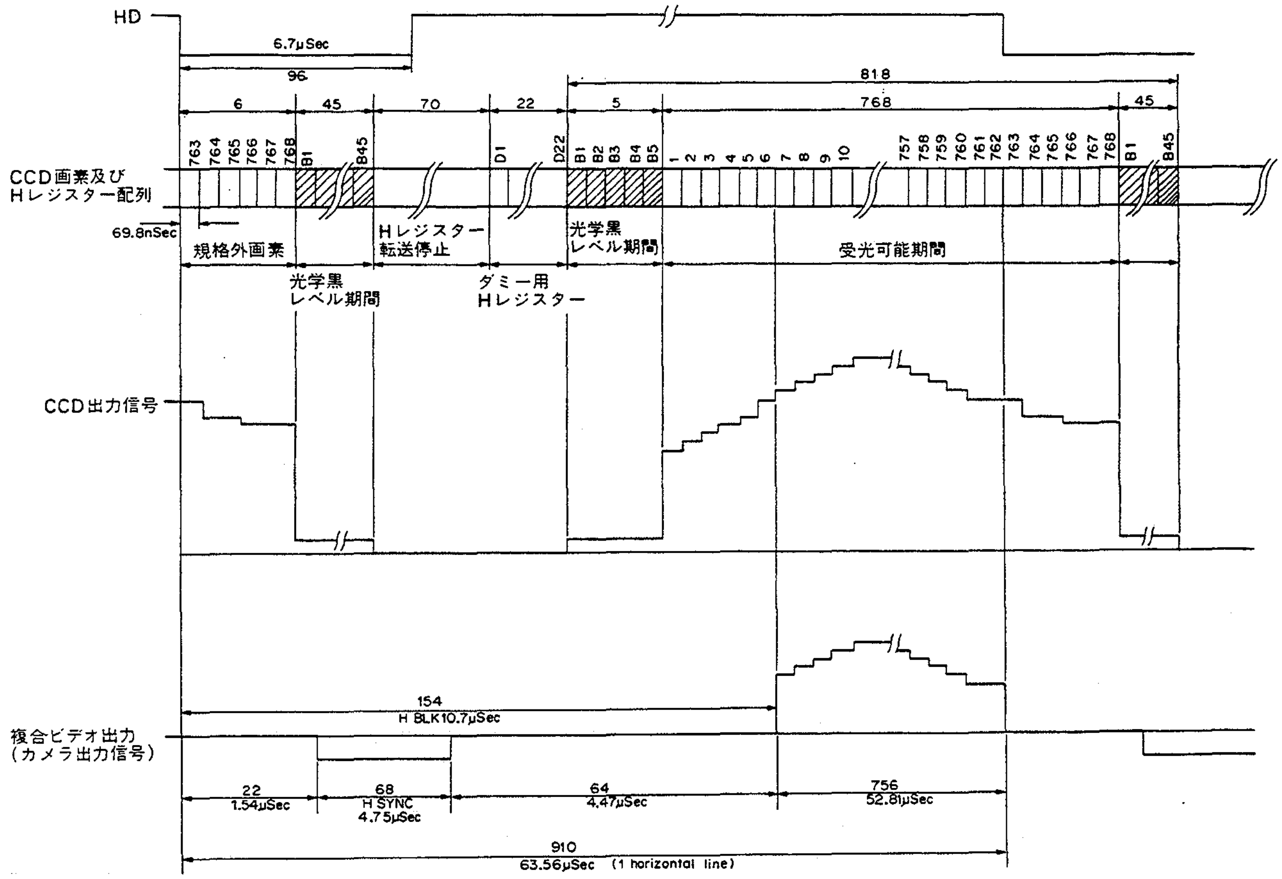

3
15.6 +0 -0.1
R5
6.5
8.5
9
5.5
100°

おさえ金具


18.5 +0.2 0
102 +0 -0.3
6
R7.65 +0.1 0
3
9
18
25
15.3 +0.2 0
6
20 +0 -0.1
10 ±0.1
3
2
13.8 +0 -0.3
21.4
98 ±0.2

2-2. CCD出力波形タイミングチャート

タイミングチャート中に記載してある周期はHDの周波数が15.734KHzのときの値です。


HD
6.7μSec
96
818
6
45
70
22
5
768
45
763
764
765
766
767
768
B1
B45
D1
D22
B1
B2
B3
B4
B5
1
2
3
4
5
6
7
8
9
10
757
758
759
760
761
762
763
764
765
766
767
768
B1
B45
CCD画素及び
Hレジスター配列
69.8nSec
規格外画素
Hレジスター
転送停止
光学黒
レベル期間
受光可能期間
光学黒
レベル期間
ダミー用
Hレジスター
CCD出力信号
154
H BLK10.7μSec
複合ビデオ出力
(カメラ出力信号)
22
1.54μSec
68
H SYNC
4.75μSec
64
4.47μSec
756
52.81μSec
910
63.56μSec (1 horizontal line)

2-3. 外部同期について

外部同期モードには
1. S/VS/VBSモード
2. HD, VDモード
3. RESTART RESETモード
の3モードがあります。

2-3-1. S/VS/VBSモード

正規のコンポジット信号（S, VSまたはVBS）を12ピンコネクターの7番ピンに加えることで，外部同期を掛けるモードです。

2-3-2. HD, VDモード

HD, VDを12ピンコネクターの6番ピンと7番ピンにそれぞれ加えることで外部同期を掛けるモードです。

●HD, VDの入力条件

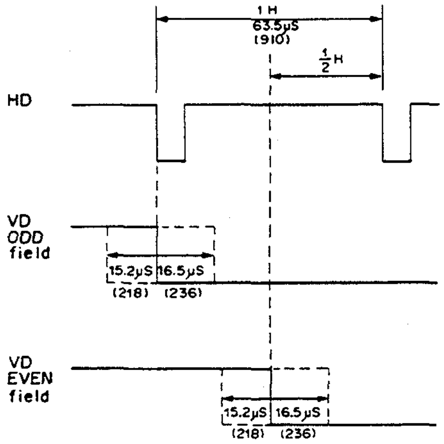
・周波数（周期）

HD　15.734kHz±1%（63.56μS±1%）

VD　244〜1023$\frac{1}{2}$H

※注意：最大垂直有効ライン数はインターレース時で493ラインです。
ノンインターレース時は，ODDフィールド，EVENフィールドとも246ラインです。

・位相



※(　)内はクロック数

イラスト中でHDの立ち下がりに対してVDの立ち下がりが進相15.2μS〜遅相16.5μS以内の時はODDフィールドになります。
また，HDの立ち下がりから$\frac{1}{2}$Hの時点に対するVDの立ち下がりが進相15.2μS〜遅相16.5μS以内の時はEVENフィールドになります。

●インターレース/ノンインターレース

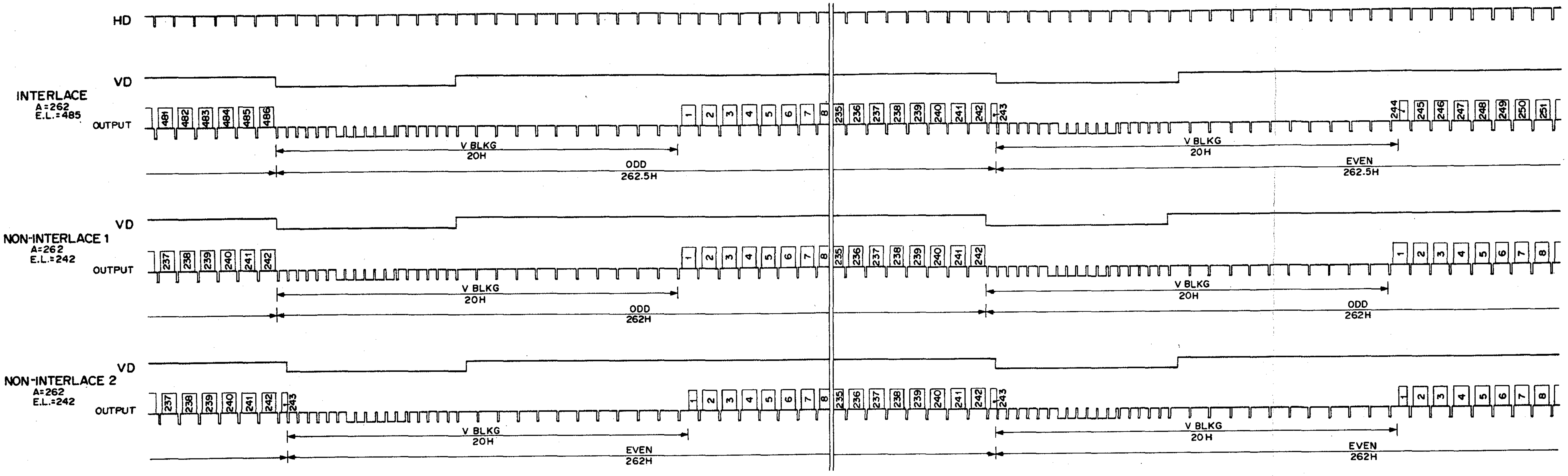
VDの入力条件を変化させることで，インターレースでもノンインターレースでも動作させることができます。（〔図1〕参照）

・インターレース

インターレースで動作させる時は，VDの周期を（A＋$\frac{1}{2}$）Hにします。「Aは244〜1023までの整数」すなわちHDの立ち下がりに対するVDの立ち下がりの位相が，VD毎に切り換わります。
するとフィールドがODD→EVEN→ODD→…と変化し，インターレースで動作します。この時の1フレームの走査線数は2A＋1ラインです。

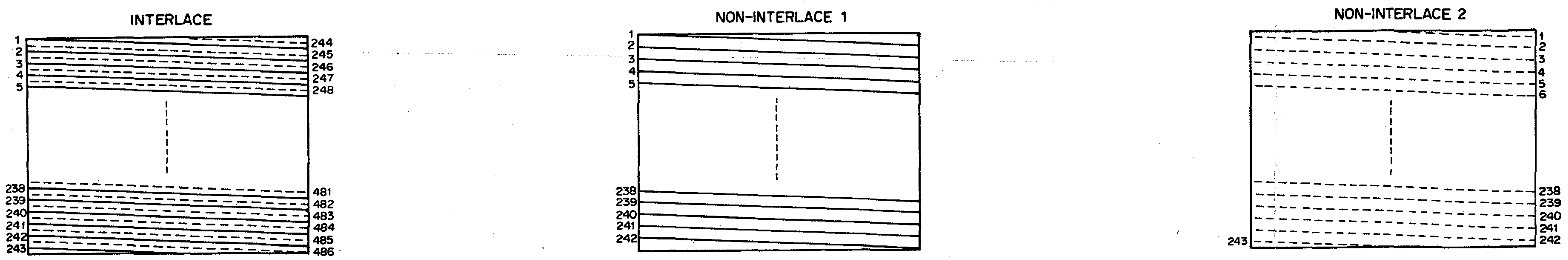
・ノンインターレース

ノンインターレースで動作させる時は，VDの周期をA Hにします。「Aは244〜1023までの整数」すなわちHDの立ち下がりに対するVDの立ち下がりの位相がVD毎に変化せず，フィールドがODD→ODD→ODD→…，又はEVEN→EVEN→EVEN→…と続き，ノンインターレースで動作します。但し，1フレームの走査線数はAラインでインターレース時の半分になります。またフレーム蓄積時には感度もインターレース時の半分になります。（〔図2〕参照）

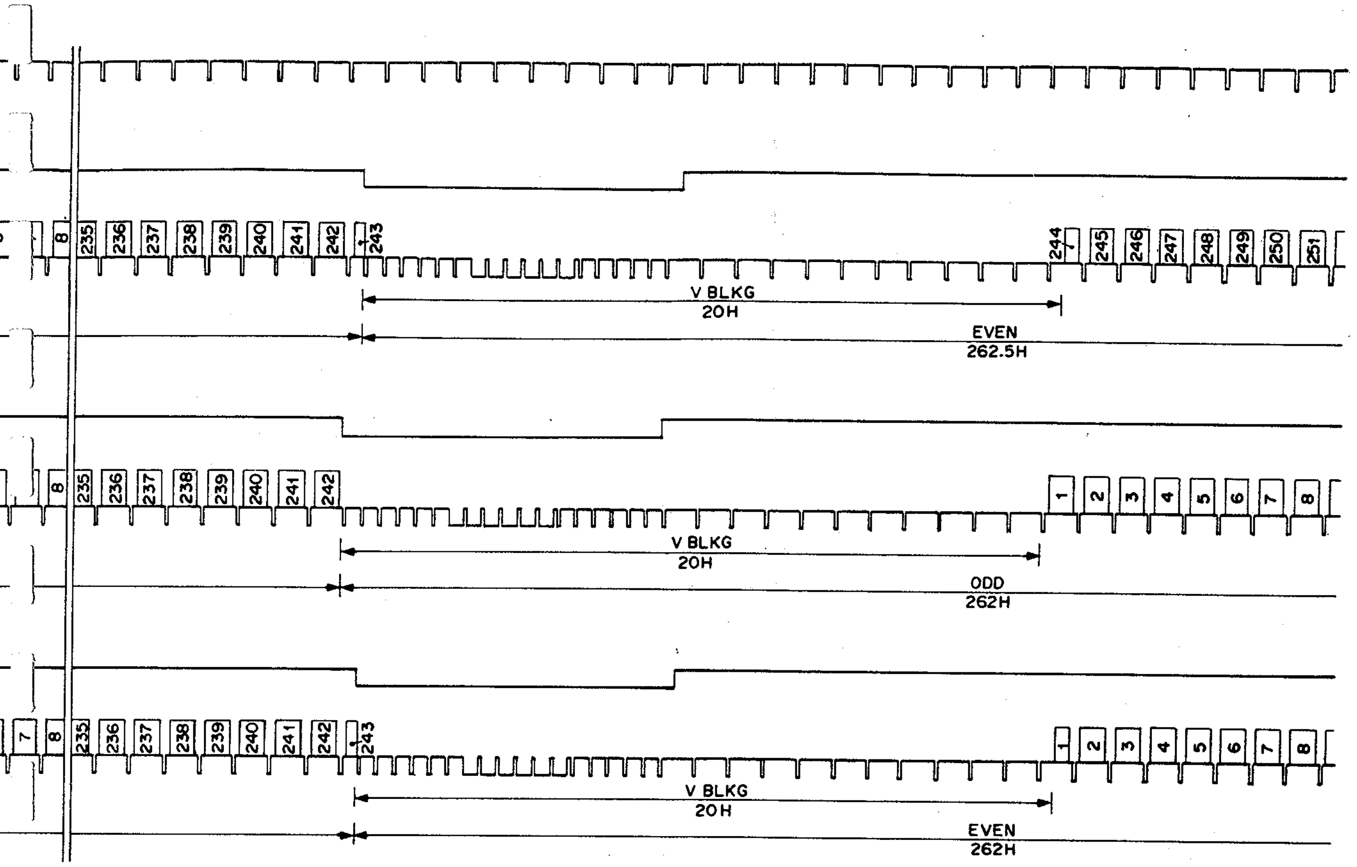

HD
VD
INTERLACE
A=262
E.L.=485
OUTPUT
481 482 483 484 485 486
1 2 3 4 5 6 7 8
235 236 237 238 239 240 241 242 243
244 245 246 247 248 249 250 251
V BLKG
20H
ODD
262.5H
EVEN
262.5H
VD
NON-INTERLACE 1
A=262
E.L.=242
OUTPUT
237 238 239 240 241 242
V BLKG
20H
ODD
262H
VD
NON-INTERLACE 2
A=262
E.L.=242
OUTPUT
237 238 239 240 241 242 243
V BLKG
20H
EVEN
262H

Note:EL means effective line
注意：E.L.は有効ライン数です。

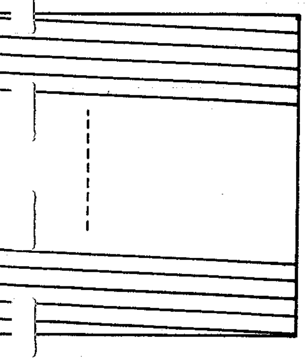
リードアウトモード設	
走査方式	走 査
蓄積時間と映像出力の関	
垂直解像度(TV	
RESTART RESET	
特 徴 と 用	


INTERLACE
1 2 3 4 5
244 245 246 247 248
238 239 240 241 242 243
481 482 483 484 485 486
NON-INTERLACE 1
1 2 3 4 5
238 239 240 241 242
NON-INTERLACE 2
1 2 3 4 5 6
238 239 240 241 242
243

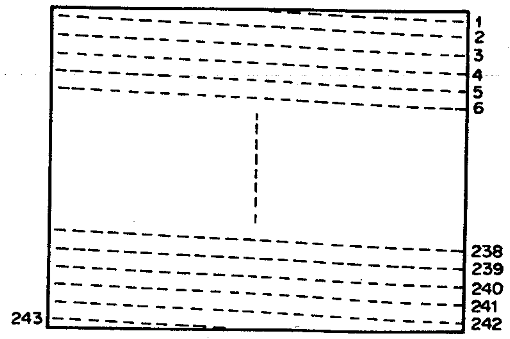
〔図1〕

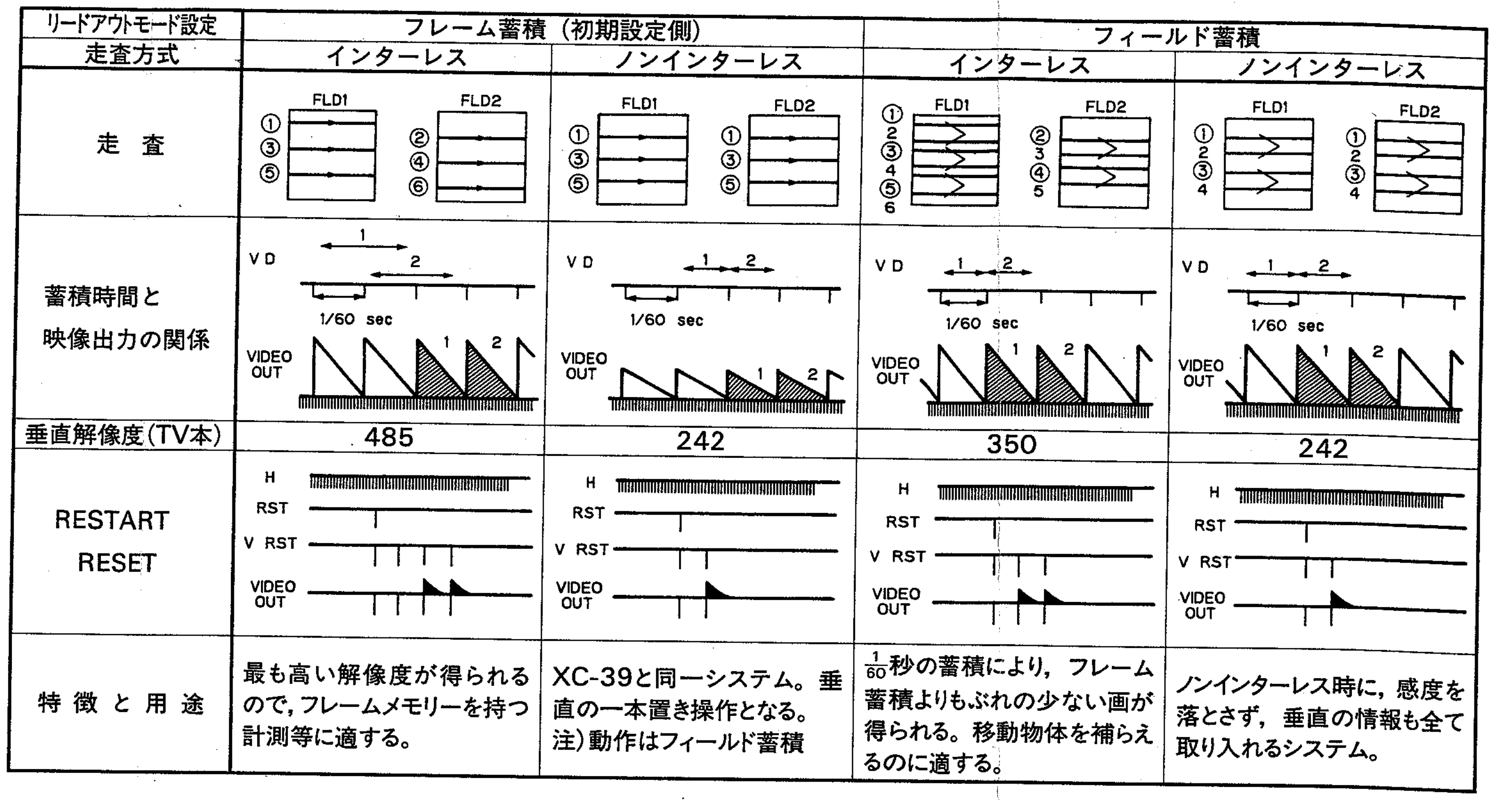

8
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
V BLKG
20H
EVEN
262.5H
8
235
236
237
238
239
240
241
242
1
2
3
4
5
6
7
8
V BLKG
20H
ODD
262H
7
8
235
236
237
238
239
240
241
242
243
1
2
3
4
5
6
7
8
V BLKG
20H
EVEN
262H

N -INTERLACE 1



NON-INTERLACE 2

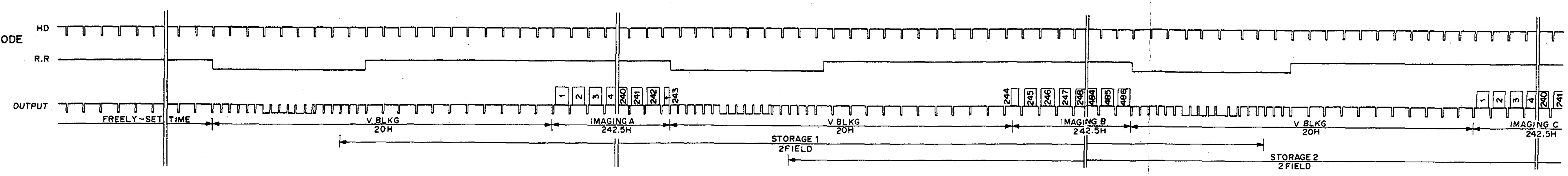

1
2
3
4
5
6
238
239
240
241
242
243



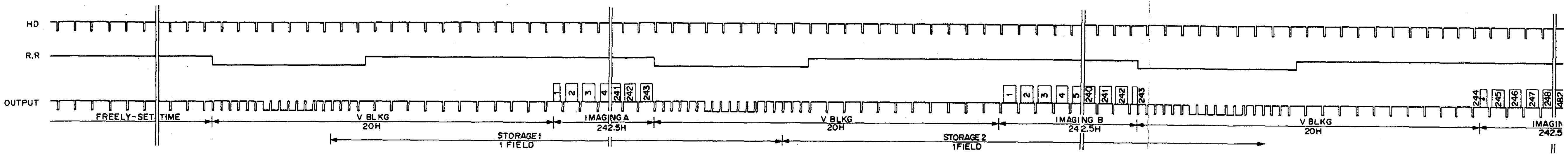
リードアウトモード設定	フレーム蓄積（初期設定側）		フィールド蓄積	
走査方式	インターレス	ノンインターレス	インターレス	ノンインターレス
走　査	FLD1 ① ③ ⑤ FLD2 ② ④ ⑥	FLD1 ① ③ ⑤ FLD2 ① ③ ⑤	FLD1 ① 2 ③ 4 ⑤ 6 FLD2 ② 3 ④ 5	FLD1 ① 2 ③ 4 FLD2 ① 2 ③ 4
蓄積時間と映像出力の関係	VD 1 2 1/60 sec VIDEO OUT 1 2	VD 1 2 1/60 sec VIDEO OUT 1 2	VD 1 2 1/60 sec VIDEO OUT 1 2	VD 1 2 1/60 sec VIDEO OUT 1 2
垂直解像度（TV本）	485	242	350	242
RESTART RESET	H RST V RST VIDEO OUT	H RST V RST VIDEO OUT	H RST V RST VIDEO OUT	H RST V RST VIDEO OUT
特徴と用途	最も高い解像度が得られるので，フレームメモリーを持つ計測等に適する。	XC-39と同一システム。垂直の一本置き操作となる。 注）動作はフィールド蓄積	$\frac{1}{60}$秒の蓄積により，フレーム蓄積よりもぶれの少ない画が得られる。移動物体を補らえるのに適する。	ノンインターレス時に，感度を落とさず，垂直の情報も全て取り入れるシステム。

〔図2〕走査方式と蓄積モードの関係

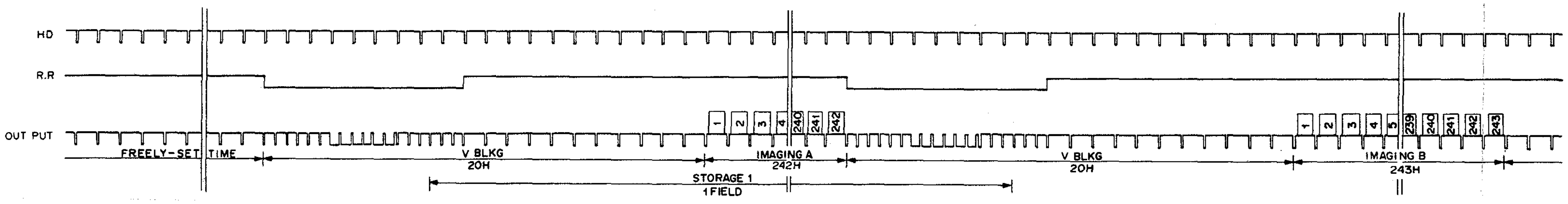
FRAME INTEGRATION MODE
INTERLACE
A=262
E.L=485


HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
1
2
3
4
240
241
242
243
IMAGING A
242.5H
V BLKG
20H
STORAGE 1
2FIELD
244
245
246
247
248
484
485
486
IMAGING B
242.5H
V BLKG
20H
STORAGE 2
2FIELD
1
2
3
4
240
241
IMAGING C
242.5H

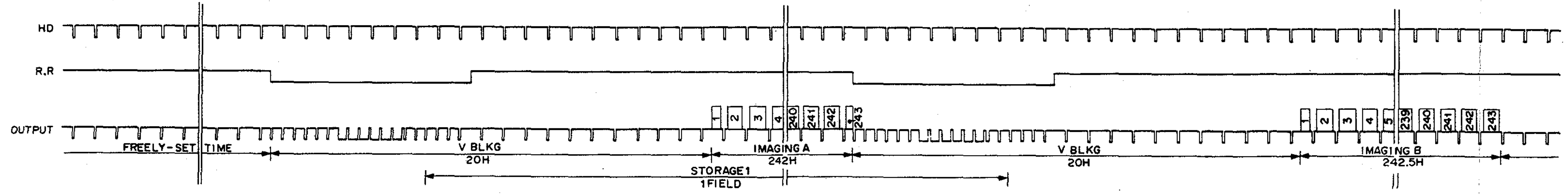
FIELD INTEGRATION MODE
INTERLACE
A=262
E.L=485

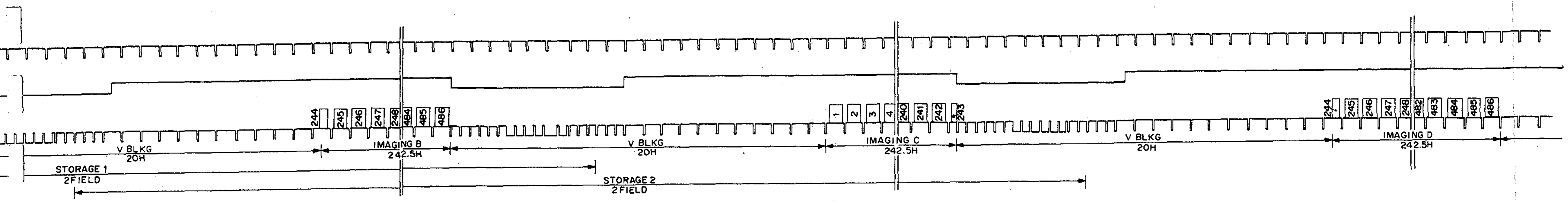

HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
STORAGE1
1 FIELD
1
2
3
4
241
242
243
IMAGING A
242.5H
V BLKG
20H
STORAGE 2
1FIELD
1
2
3
4
5
240
241
242
243
IMAGING B
242.5H
V BLKG
20H
244
245
246
247
248
482
IMAGIN
242.5

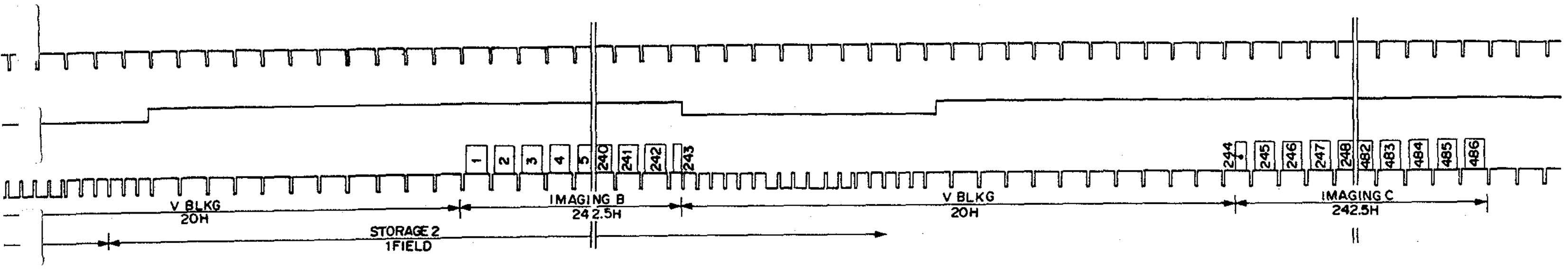
NON-INTERLACE 1
A=262
E.L=243

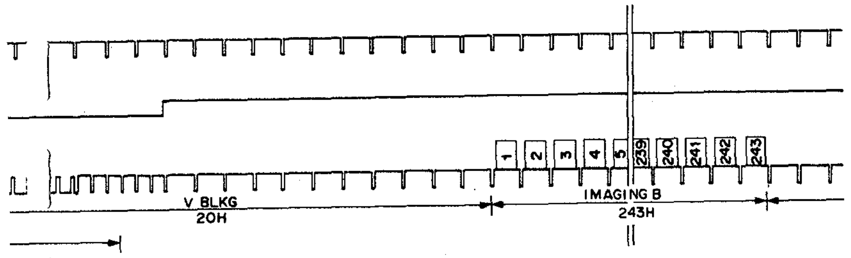

HD
R.R
OUT PUT
FREELY-SET TIME
V BLKG
20H
STORAGE 1
1FIELD
1
2
3
4
240
241
242
IMAGING A
242H
V BLKG
20H
1
2
3
4
5
239
240
241
242
243
IMAGING B
243H

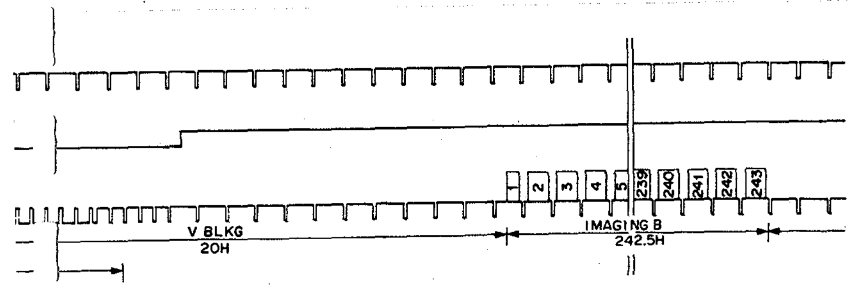
NON-INTERLACE2
A=262
E.L=242


HD
R.R
OUTPUT
FREELY-SET TIME
V BLKG
20H
STORAGE1
1FIELD
1
2
3
4
240
241
242
243
IMAGING A
242H
V BLKG
20H
1
2
3
4
5
239
240
241
242
243
IMAGING B
242.5H


V BLKG
20H
IMAGING B
242.5H
STORAGE 1
2FIELD
V BLKG
20H
STORAGE 2
2FIELD
IMAGING C
242.5H
V BLKG
20H
IMAGING D
242.5H


V BLKG
20H
IMAGING B
242.5H
STORAGE 2
1FIELD
V BLKG
20H
IMAGING C
242.5H


V BLKG
20H
IMAGING B
243H


V BLKG
20H
IMAGING B
242.5H

2-3-3. RESTART RESETモード

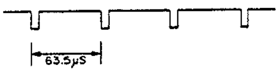
RESTART RESET（R.R）モードを使うと任意の時刻に1画面の情報を取り出すことができます。
R.Rモードを使う場合は，カメラ内部でモードを設定する必要があります。
2-4.モード設定を参照してモードを設定して下さい。HD, R.Rを12ピンコネクターの6番ピンと7番ピンにそれぞれ加えることで，出力を得ることができます。

●HD，R.Rの入力条件

・周波数（周期）

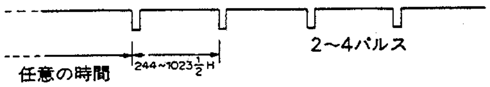
HD　15.734kHz±1%（63.56μS±1%）

連続パルス



R.R　244～1023$\frac{1}{2}$H

2～4パルス（モードによって異なります。）



・位相

2-3-2. HD，VDモードの位相条件と同じです。
参照して下さい。

●タイミングチャートの説明

〔図3〕は各動作モード別のタイミングチャートです。以下に詳細を説明します。

・フレーム蓄積，インターレースモード

R.Rが4パルス必要です。R.Rの周期を（A+$\frac{1}{2}$）Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING C（ODD）とIMAGING D（EVEN）の期間にそれぞれSTORAGE 1，STORAGE 2の間に撮像した情報が出力されます。IMAGING A，IMAGING Bの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

・フィールド蓄積，インターレースモード

R.Rが3パルス必要です。R.Rの周期を（A+$\frac{1}{2}$）Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING B（ODD）とIMAGING C（EVEN）の期間にそれぞれSTORAGE 1，STORAGE 2の間に撮像した情報が出力されます。IMAGING Aの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

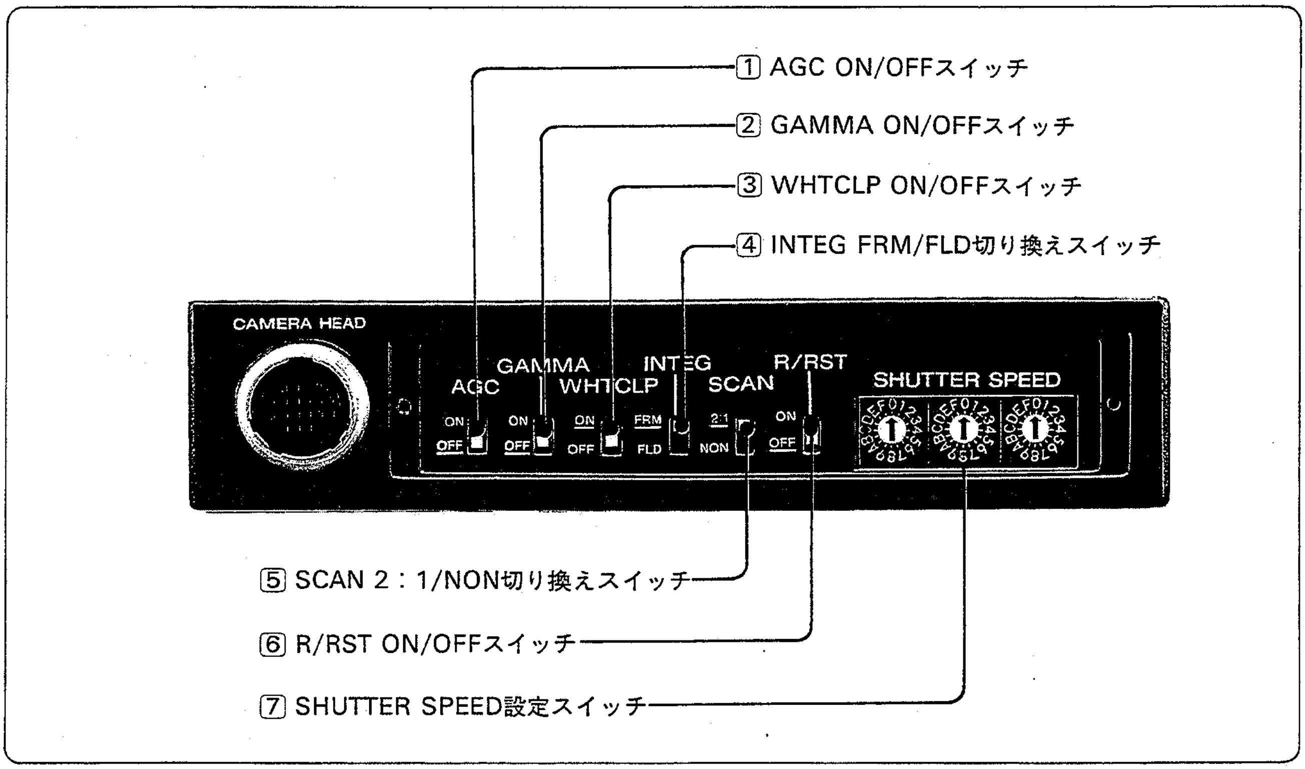
・ノンインターレースモード

蓄積モードに関係なくR.Rが2パルス必要です。
R.Rの周期をA Hにします。「Aは244～1023までの整数（図はA=262）」
IMAGING Bの期間にSTORAGE 1の間に撮像した情報が出力されます。IMAGING Aの期間にCCDがリセットされます。よって，この間に出力される信号は意味がありません。

2-4. モード設定

XC-77RRは，用途に応じて動作モードを切換えることが可能です。モードの設定は，前面パネルとカメラコントロールユニット内のPR-133基板，TG-58基板，DR-96基板の各スイッチで行います。

2-4-1. 前面パネルにおけるモード設定


① AGC ON/OFFスイッチ
② GAMMA ON/OFFスイッチ
③ WHTCLP ON/OFFスイッチ
④ INTEG FRM/FLD切り換えスイッチ
CAMERA HEAD
AGC
GAMMA
WHTCLP
INTEG
SCAN
R/RST
SHUTTER SPEED
ON
OFF
FRM
FLD
2:1
NON
⑤ SCAN 2：1/NON切り換えスイッチ
⑥ R/RST ON/OFFスイッチ
⑦ SHUTTER SPEED設定スイッチ

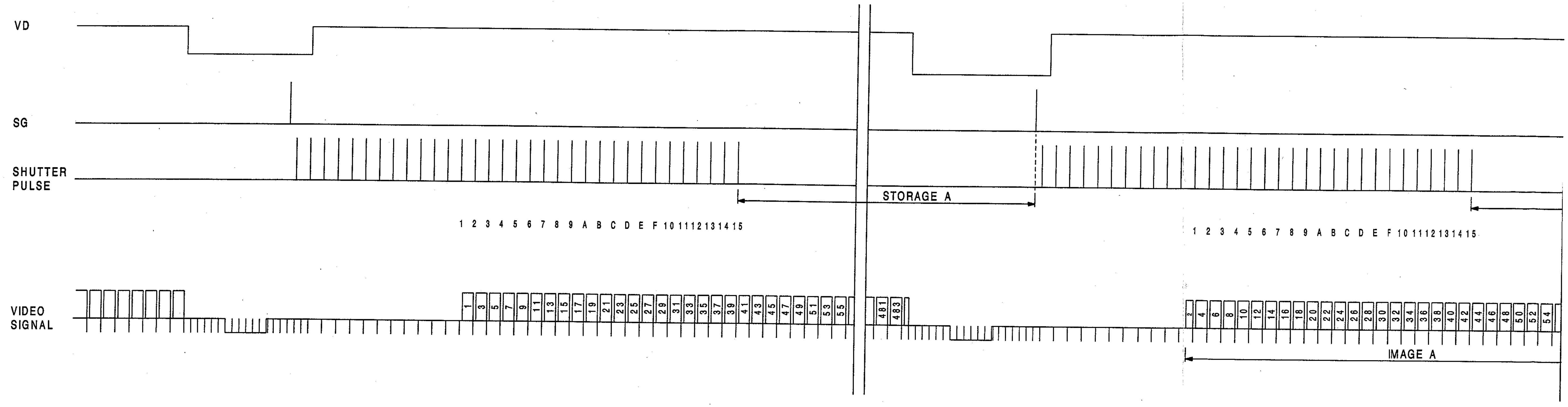
1. AGC（オートゲインコントロール）ON/OFFスイッチ
映像出力信号のゲイン（利得）を設定します。
“ON”に設定すると，AGC機能が働きます。
“OFF”に設定すると，ゲインが0dBに固定されます。
工場出荷時は，“OFF”に設定されています。

2. GAMMA（ガンマ補正）ON/OFFスイッチ
映像出力信号のガンマ補正を設定します。
“ON”に設定すると，ガンマ補正が行われた映像信号が出力されます。
“OFF”に設定すると，ガンマ補正を行わず，線形な映像信号を出力します。よって，被写体の光量に比例した映像信号を得ることができます。
工場出荷時は，“OFF”に設定されています。

3. WHTCLP（ホワイトクリップ）ON/OFFスイッチ
映像出力信号のホワイトクリップレベルを設定します。
“ON”に設定すると，クリップレベルが110 IRE±10 IREになります。
“OFF”に設定すると，クリップレベルが140 IRE±10 IREになります。
工場出荷時は，“ON”に設定されています。

4. INTEG（蓄積モード）FRM/FLD（フレーム/フィールド）切換えスイッチ
CCDのフォトセンサーから信号電荷を読み出す周期を設定します。
“FRM”に設定すると，信号電荷をフレーム毎に読み出すフレーム蓄積モードになります。
“FLD”に設定すると，信号電荷をフィールド毎に読み出すフィールド蓄積モードになります。
工場出荷時は，“FRM”に設定されています。

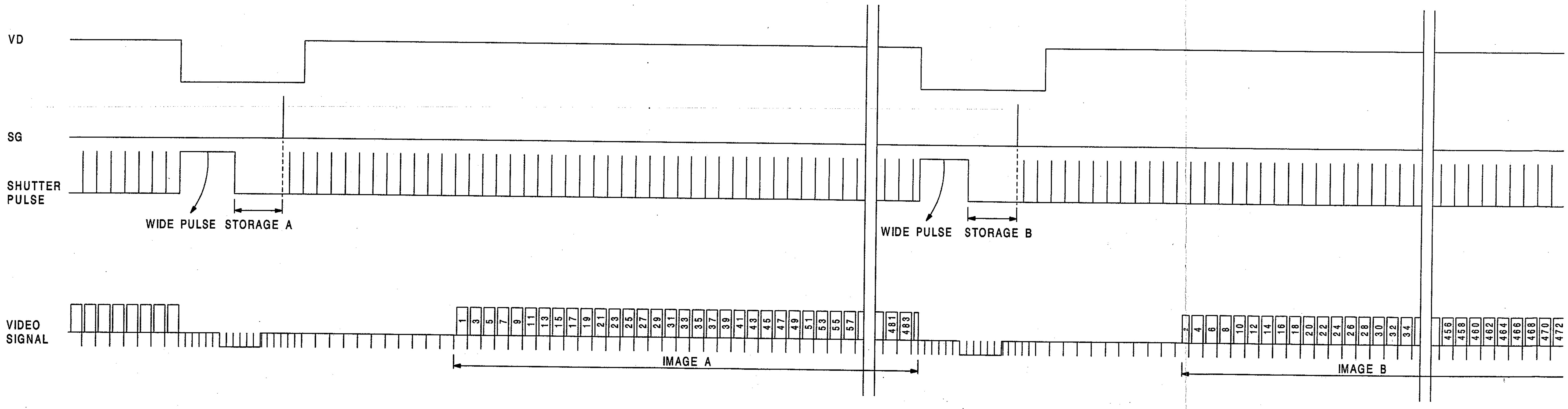
注意 フレーム蓄積モードでは，ノンインターレース動作時の感度が，インターレース動作時と比べて半分になります。


VD
SG
SHUTTER PULSE
STORAGE A
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55
481 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54
IMAGE A

Normal Shutter (EIA)

Low speed mode

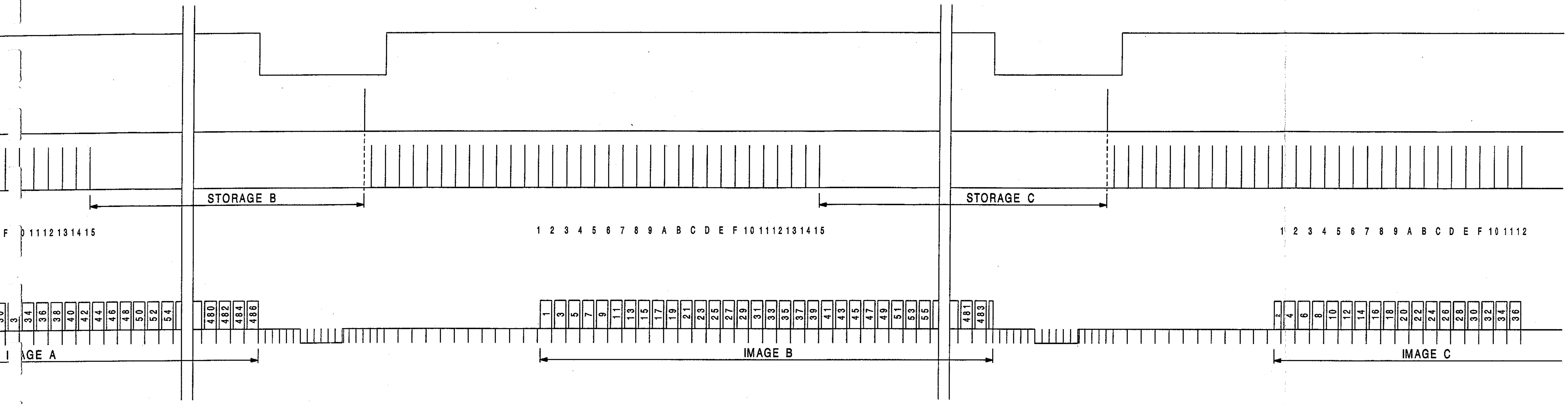
Fig.1


VD
SG
SHUTTER PULSE
WIDE PULSE
STORAGE A
WIDE PULSE
STORAGE B
VIDEO SIGNAL
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57
481 483
IMAGE A
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
456 458 460 462 464 466 468 470 472
IMAGE B

Normal Shutter (EIA)

High speed mode

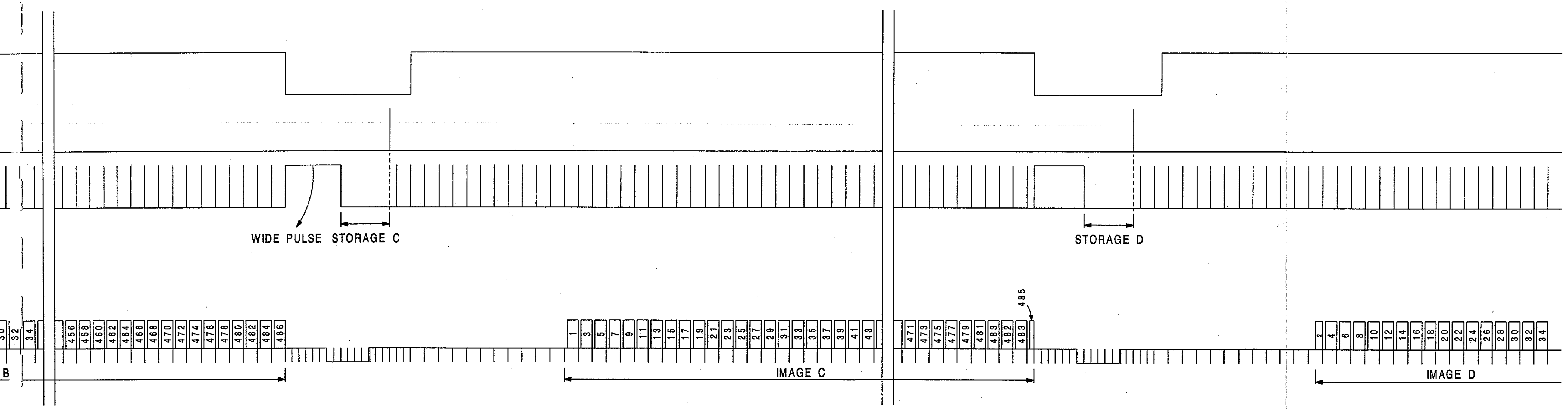
Fig.2


STORAGE B
STORAGE C
F 0 11 12 13 14 15
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12
34 36 38 40 42 44 46 48 50 52 54
480 482 484 486
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55
481 483
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36
AGE A
IMAGE B
IMAGE C

Normal Shutter (EIA)

Low speed mode

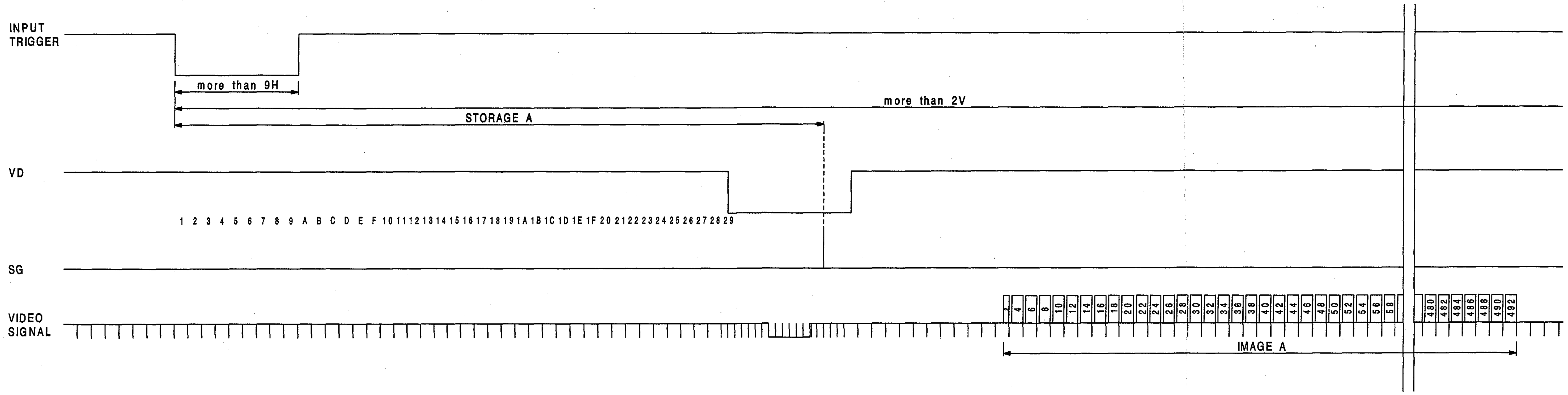
Fig.1


WIDE PULSE
STORAGE C
STORAGE D
32 34
456 458 460 462 464 466 468 470 472 474 476 478 480 482 484 486
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43
471 473 475 477 479 481 483 482 483
485
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34
B
IMAGE C
IMAGE D

Normal Shutter (EIA)

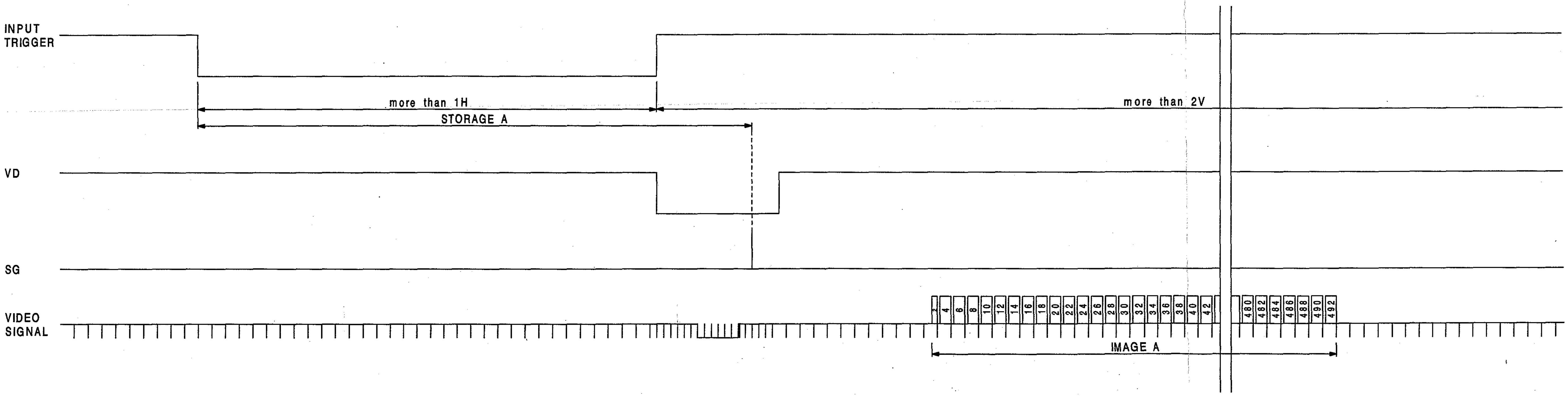
High speed mode

Fig.2


INPUT TRIGGER
more than 9H
more than 2V
STORAGE A
VD
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29
SG
VIDEO SIGNAL
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58
480 482 484 486 488 490 492
IMAGE A

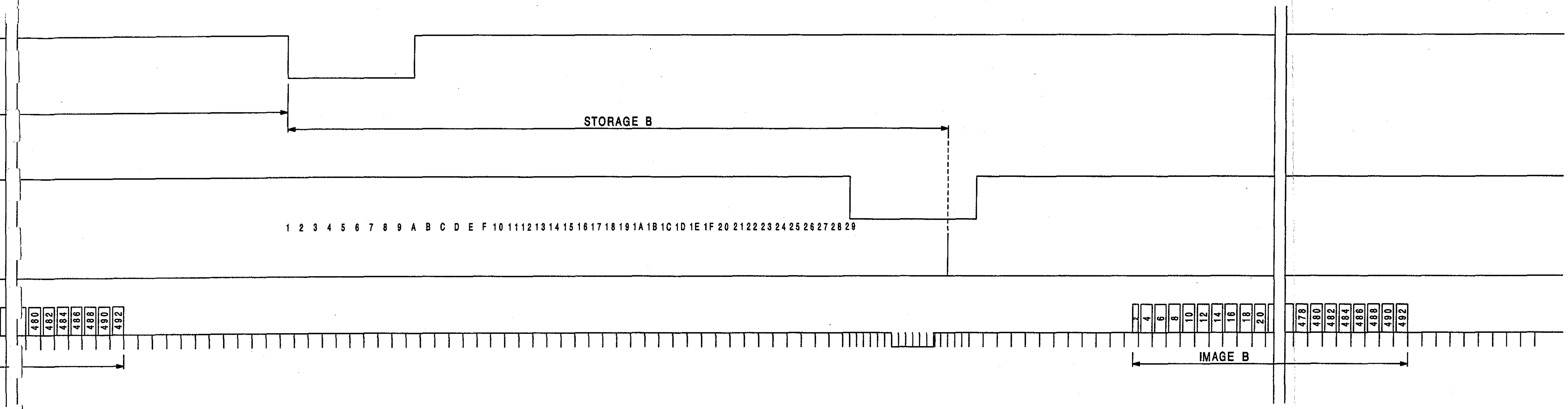
Donpisha Shutter mode (E

Fig.3


INPUT TRIGGER
more than 1H
more than 2V
STORAGE A
VD
SG
VIDEO SIGNAL
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42
480 482 484 486 488 490 492
IMAGE A

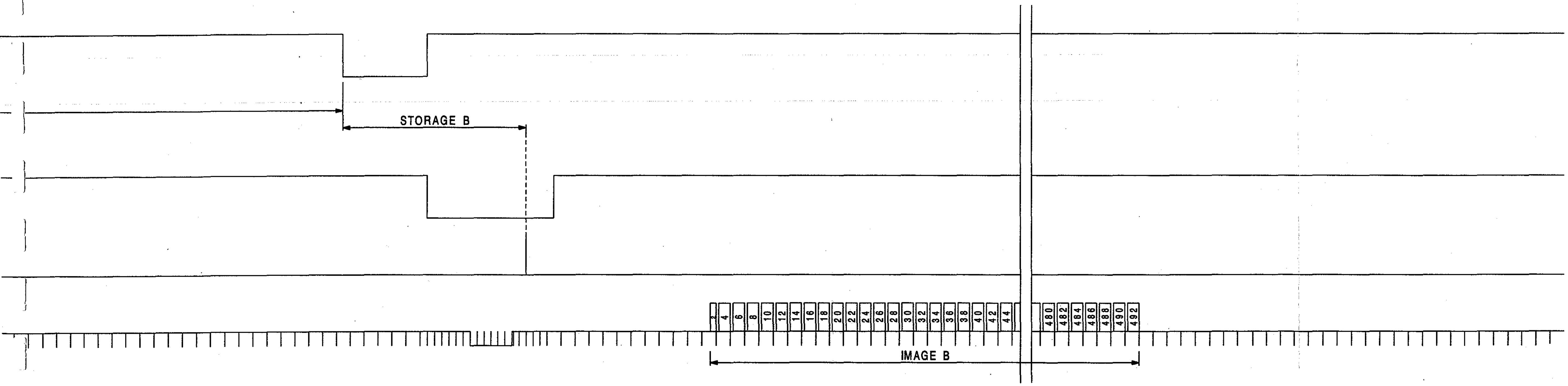
Long Term Shutter (EIA)

Fig.4


STORAGE B
1 2 3 4 5 6 7 8 9 A B C D E F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29
480 482 484 486 488 490 492
2 4 6 8 10 12 14 16 18 20
478 480 482 484 486 488 490 492
IMAGE B

Donpisha Shutter mode (EIA)

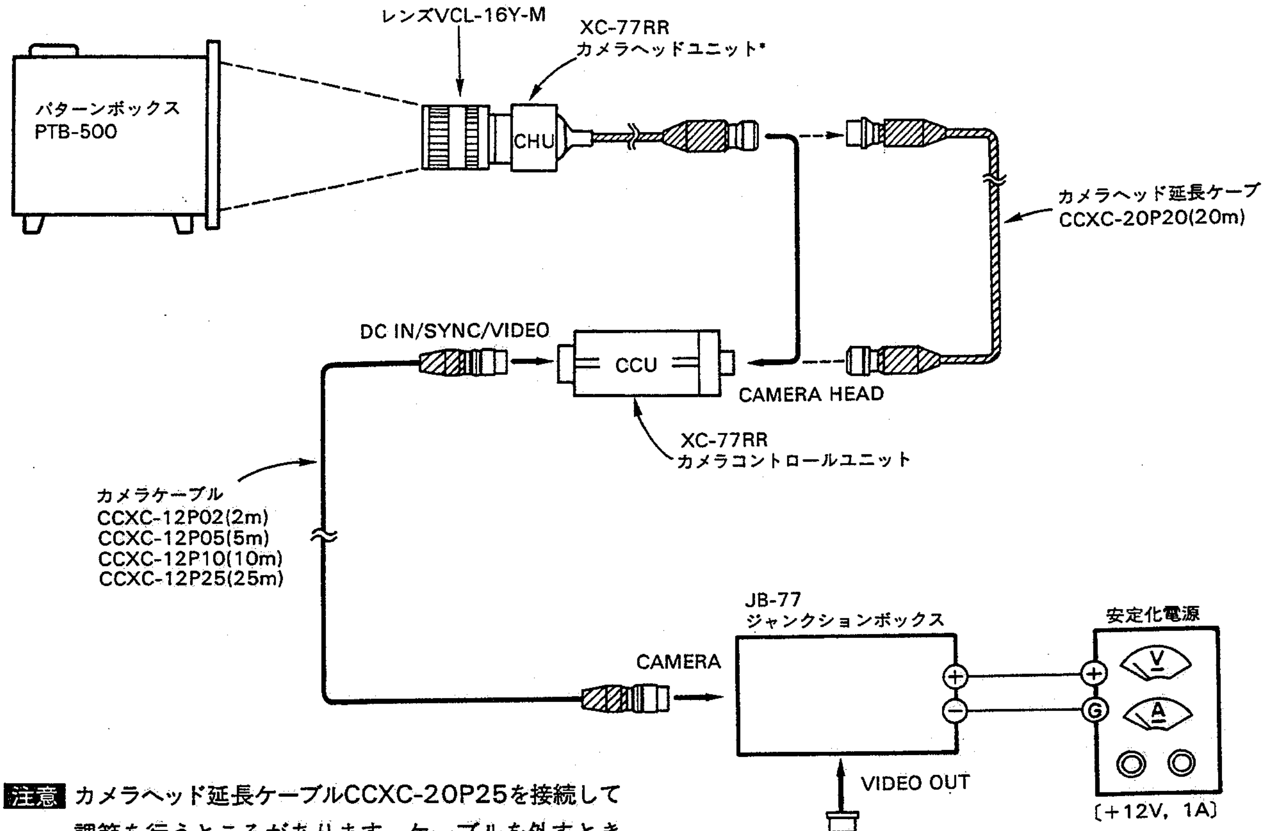
Fig.3

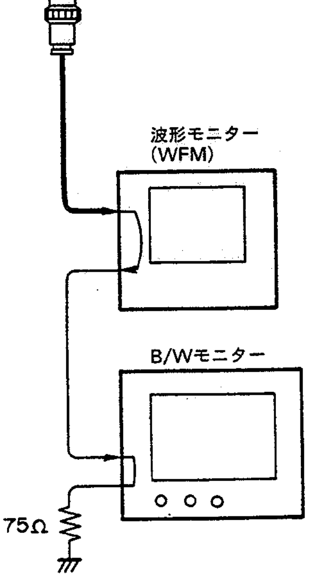

STORAGE B
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44
480 482 484 486 488 490 492
IMAGE B

Long Term Shutter (EIA)

Fig.4

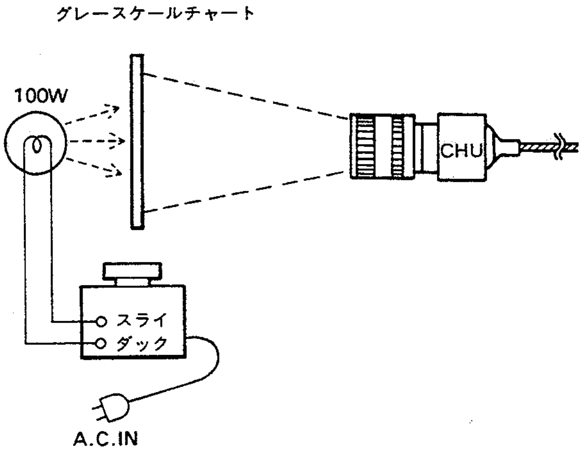
〔接続方法2〕


レンズVCL-16Y-M
XC-77RR
カメラヘッドユニット*
パターンボックス
PTB-500
CHU
カメラヘッド延長ケーブル*
CCXC-20P20(20m)
DC IN/SYNC/VIDEO
CCU
CAMERA HEAD
XC-77RR
カメラコントロールユニット
カメラケーブル
CCXC-12P02(2m)
CCXC-12P05(5m)
CCXC-12P10(10m)
CCXC-12P25(25m)
JB-77
ジャンクションボックス
CAMERA
安定化電源
V
A
G
VIDEO OUT
〔+12V, 1A〕


波形モニター
(WFM)
B/Wモニター
75Ω

注意 カメラヘッド延長ケーブルCCXC-20P25を接続して調節を行うところがあります。ケーブルを外すとき，および接続するときは，必ず電源供給用機器の電源スイッチをOFFにしてから行って下さい。
カメラヘッドユニットは三脚アタッチメントVCT-77RRを必ず使って，三脚に固定して下さい。取りつけ方法は，1-18(J)頁を参照して下さい。

〔パターンボックスが入手困難な場合〕
下図のような簡易光源で調整を行って下さい。


グレースケールチャート
100W
CHU
スライ
ダック
A.C.IN

4-3-3. SHP/SHD調整

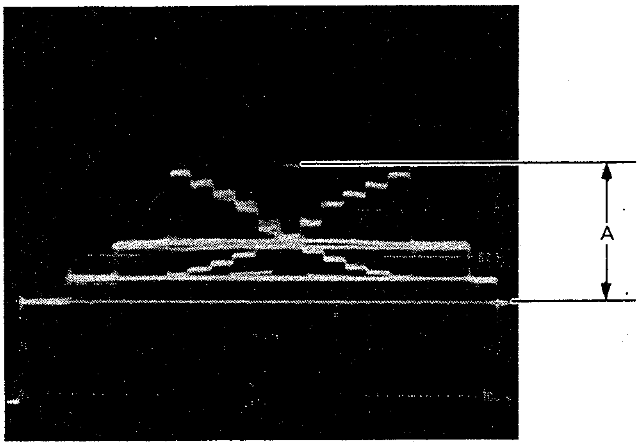
SHP調整準備

- 被写体はグレースケールチャートです。
- 延長ケーブルを使ってカメラヘッドユニットとカメラコントロールユニットを接続します。(この作業は，電源をOFFにして行って下さい。)
- ⊘RV6をメカニカルセンターにします。
- ⊘RV13を右一杯に回します。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	OFF	FLD	2：1	OFF

絞り調整

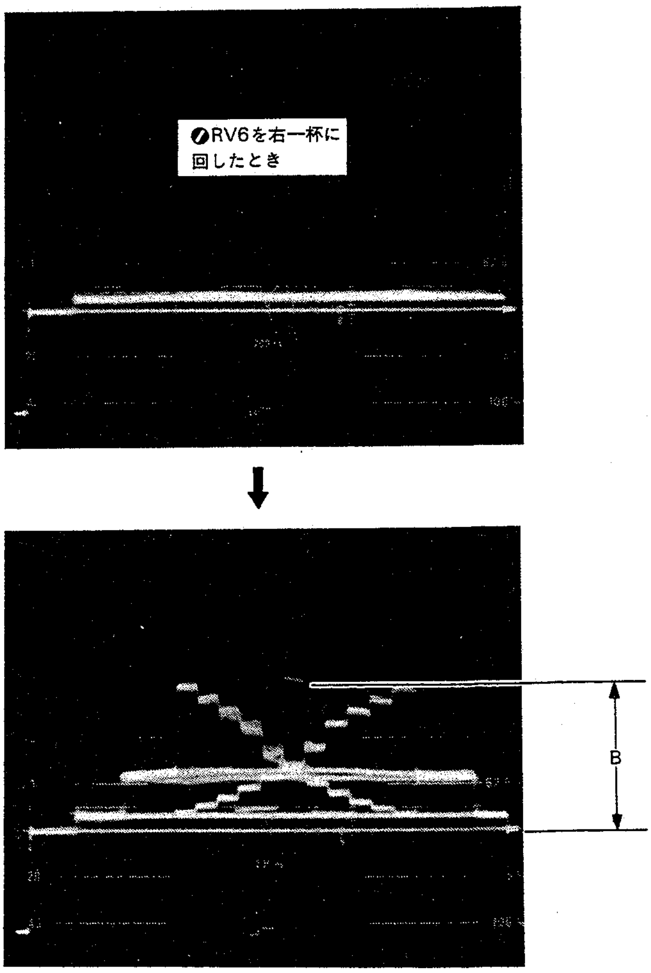
測定器：波形モニター（WFM）
調整点：レンズ絞り
規　格：A≒60 IRE

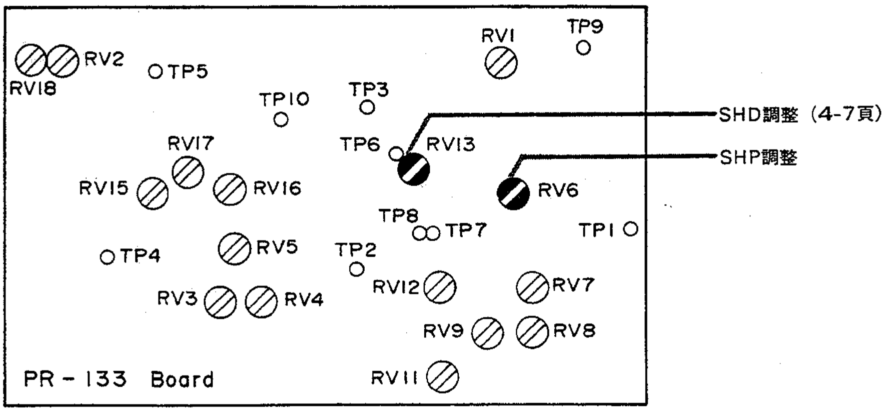


SHP調整

- ⊘RV6を右一杯に回します。

測定器：波形モニター（WFM）
調整点：⊘RV6（左へゆっくり回す）
規　格：Bが最大(⊘RV6を右から左へ回したときの2度目のピークにセットする。)




RV2
RV18
TP5
TP10
TP3
RV1
TP9
SHD調整（4-7頁）
SHP調整
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
PR－133 Board
RV11

（前面パネル側）

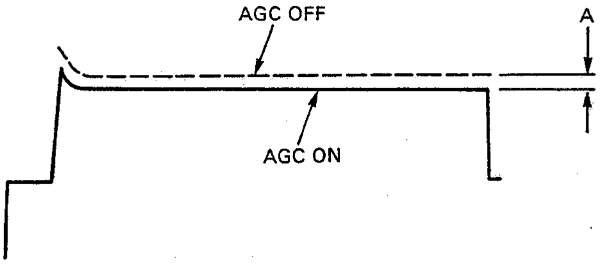
SHD調整準備

- 被写体はグレースケールチャートです。
- レンズ絞りをクローズにします。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	NON	OFF

SHD仮調整

測定器：波形モニター（WFM）
調整点：⊘RV13
規　格：AGC ON/OFFスイッチを “OFF” から “ON” に切り換えたとき，
2^{+0}_{-1} IRE（=A）だけレベルが下がる。



確　認

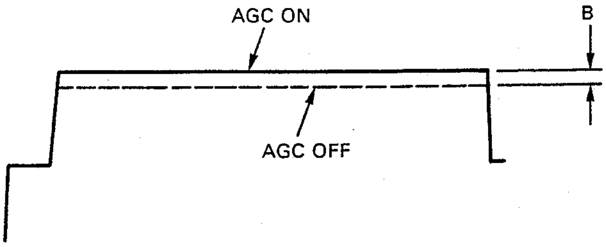
1. AGC ON/OFFスイッチが “ON” であることを確認します。
2. FPN（縦筋ノイズ）が白黒モニター上に見えないことを確認します。FPNが見えるときは，“SHP調整準備” からやり直して下さい。
3. レンズ絞りをF5.6にして，白黒モニター上の画質に異常がないことを確認します。異常があるときには，“SHP調整準備” からやり直して下さい。
4. SCAN 2：1/NONスイッチを “2：1” に切り換えたときに，白黒モニター上の画質に異常がないことを確認します。異常があるときには，“SHP調整準備” からやり直して下さい。

SHD調整

- 延長ケーブルは使わず，カメラヘッドユニットのケーブルをカメラコントロールユニットに接続します。（この作業は，電源をOFFにして行って下さい。）
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	ON	OFF	FLD	2：1	OFF

測定器：波形モニター（WFM）
調整点：⊘RV13
規　格：AGC ON/OFFスイッチを “OFF” から “ON” に切り換えたとき，
2^{+0}_{-1} IRE（=B）だけレベルが上がる。



確　認

1. AGC ON/OFFスイッチが “ON” であることを確認します。
2. FPNが白黒モニター上に見えないことを確認します。FPNが見えるときは，“SHP調整準備”からやり直して下さい。
3. SCAN 2：1/NONスイッチを “NON” に切り換えたときに，FPNが白黒モニター上に見えないことを確認します。FPNが見えるときには，“SHP調整準備” からやり直して下さい。
4. レンズ絞りをF5.6にして，白黒モニター上の画質に異常がないことを確認します。異常があるときには，“SHP調整準備” からやり直して下さい。

4-3-4. セットアップ調整

準　備

- 被写体はグレースケールチャートです。
- レンズ絞りをクローズにします。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2 : 1	OFF

レベル調整1（γ OFF）

測定器：波形モニター（WFM）

調整点：⊘RV4

規　格：A=7.5±0.5 IRE

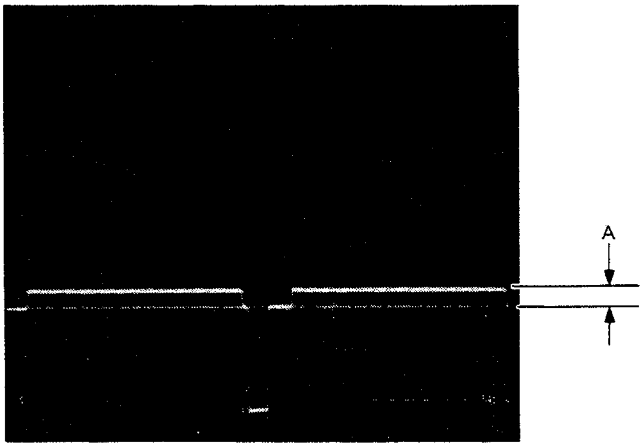
レベル調整2（γ ON）

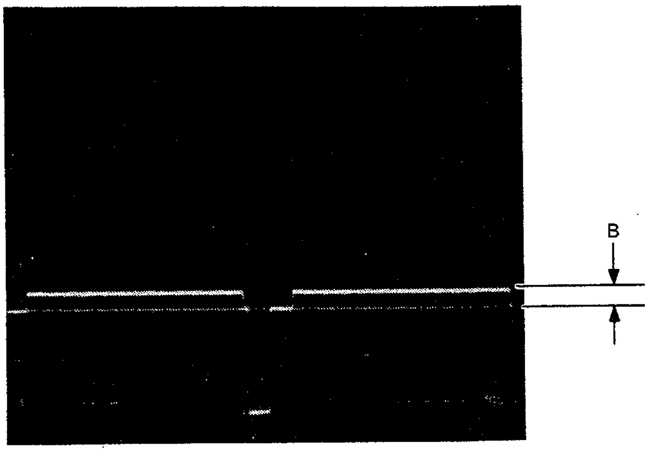
- GAMMA ON/OFFスイッチを“ON”にします。

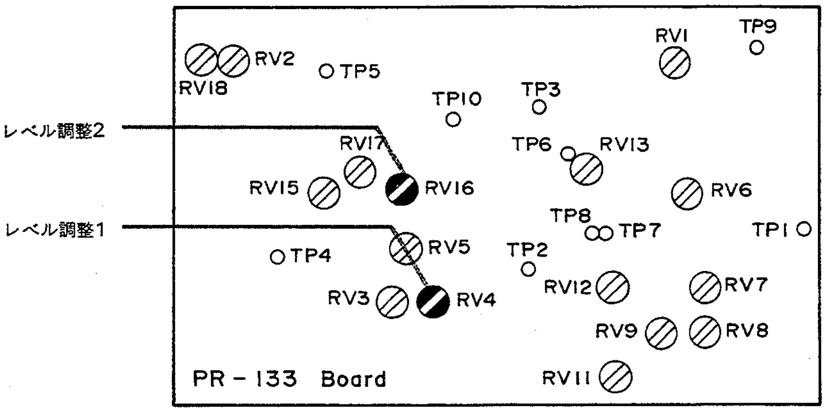
測定器：波形モニター（WFM）

調整点：⊘RV16

規　格：B=7.5±0.5 IRE






RV2
RV18
TP5
TP10
TP3
RV1
TP9
レベル調整2
RV17
RV15
RV16
TP6
RV13
RV6
レベル調整1
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR－133 Board
RV11

（前面パネル側）

4-3-5. シンク調整

準　備

- 被写体はグレースケールチャートです。
- レンズ絞りはクローズです。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2：1	OFF

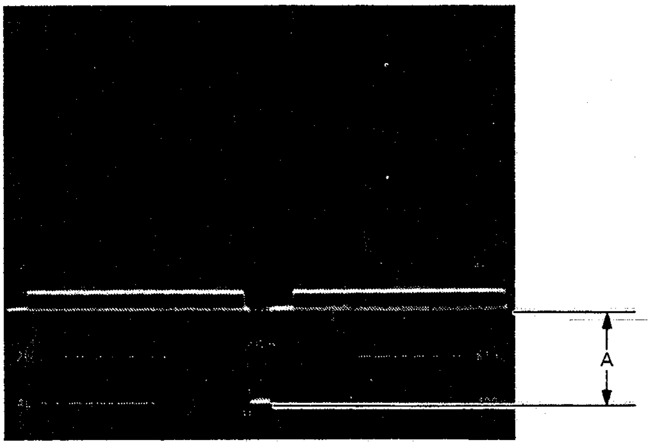
レベル調整1（γ OFF）

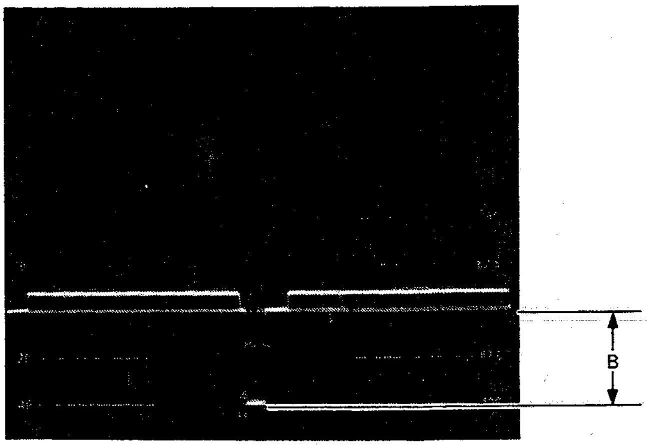
測定器：波形モニター（WFM）
調整点：⊘RV5
規　格：A=40±4 IRE

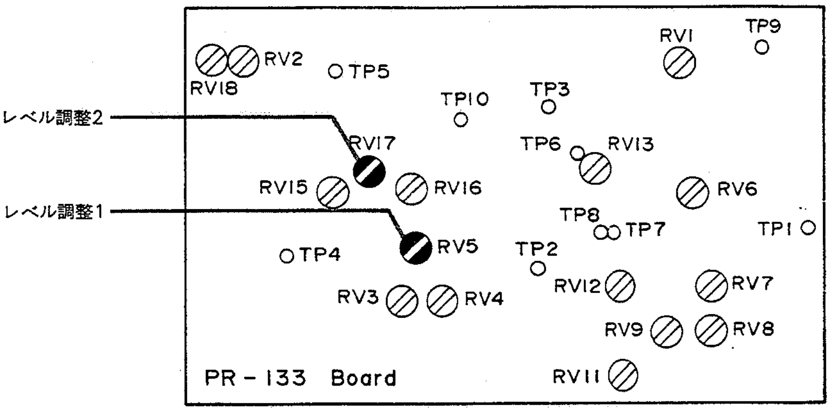
レベル調整2（γ ON）

- GAMMA ON/OFFスイッチを“ON”にします。

測定器：波形モニター（WFM）
調整点：⊘RV17
規　格：B=40±4 IRE






レベル調整2
レベル調整1
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
RV15
RV16
TP6
RV13
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR-133 Board

（前面パネル側）

4-3-6. 固定ゲイン感度調整

準　備

- 被写体はグレースケールチャートです。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

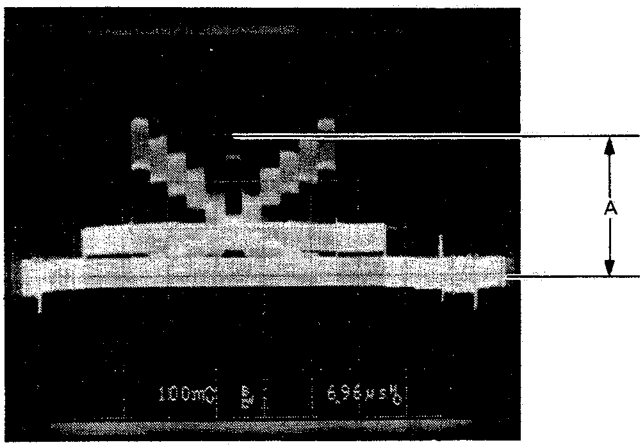
AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2：1	OFF

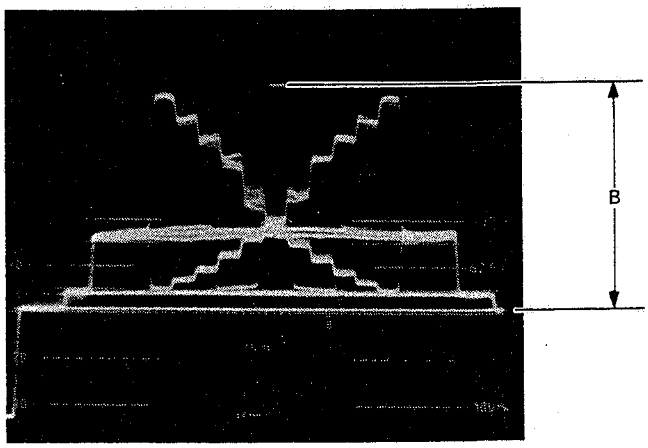
絞り調整

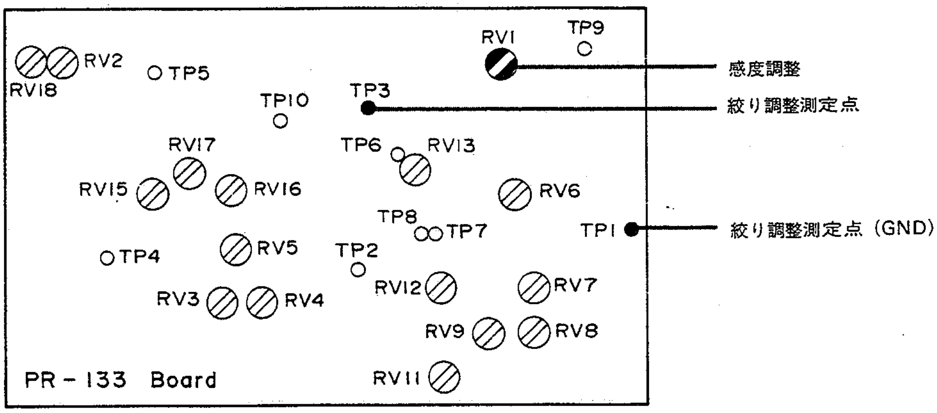
測定器：オシロスコープ
測定点：TP3（GND：TP1）
調整点：レンズ絞り
規　格：A=300±3mV

感度調整

測定器：波形モニター（WFM）
調整点：◐RV1
規　格：B=100±3 IRE






RV2
RV18
TP5
TP10
TP3
RV1
TP9
感度調整
絞り調整測定点
RV17
RV15
RV16
TP6
RV13
RV6
TP8
TP7
TP1
絞り調整測定点（GND）
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
PR－133 Board
RV11

（前面パネル側）

4-3-7. AGC調整

準　備

- 被写体はグレースケールチャートです。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
OFF	OFF	ON	FRM	2：1	OFF

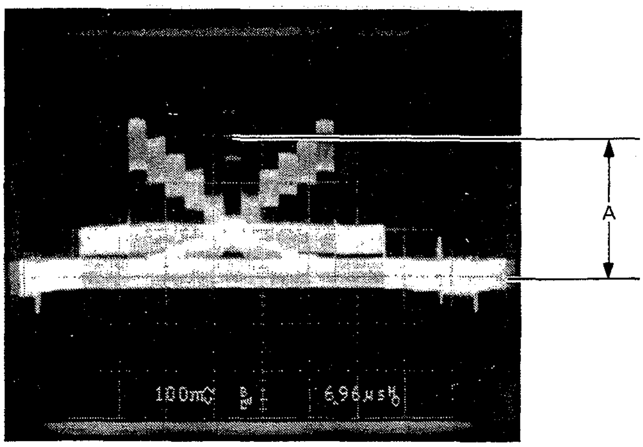
絞り調整（前項から引続き行う場合は省略可）

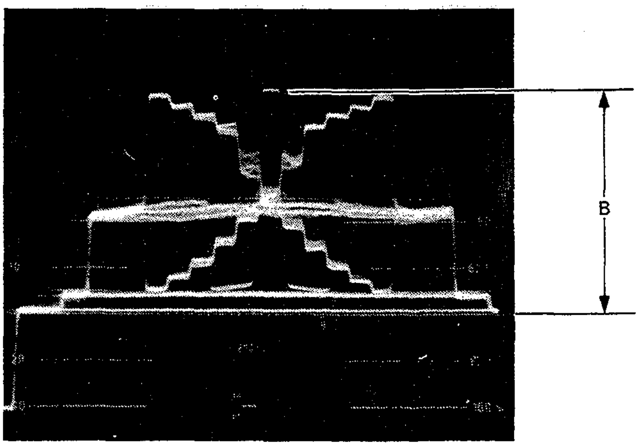
測定器：オシロスコープ
測定点：TP3（GND：TP1）
調整点：レンズ絞り
規　格：A=300±3mV

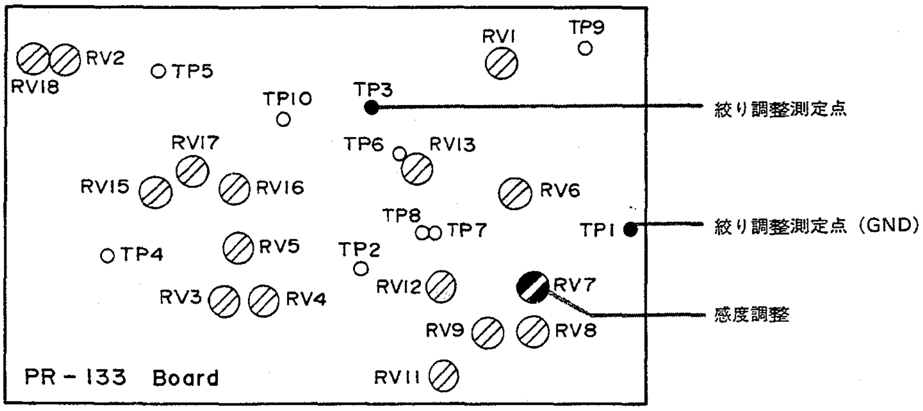
感度調整

- GAMMA ON/OFFスイッチを“ON”にします。

測定器：波形モニター（WFM）
調整点：●RV7
規　格：B=100±3 IRE






RV18
RV2
TP5
RV1
TP9
TP10
TP3
絞り調整測定点
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
絞り調整測定点（GND）
TP4
RV5
TP2
RV12
RV7
感度調整
RV3
RV4
RV9
RV8
PR－133 Board
RV11

（前面パネル側）

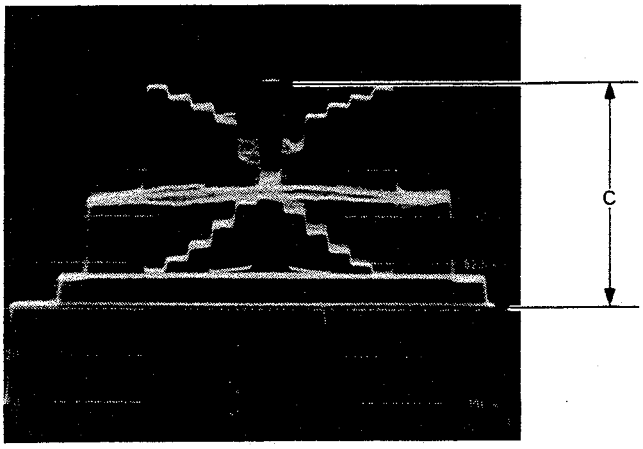
（AGC調整続き）

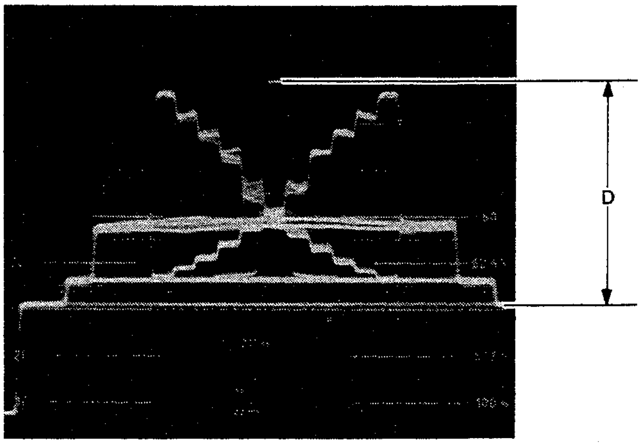
レベル調整1（γ ON）
- AGC ON/OFFスイッチを“ON”にします。

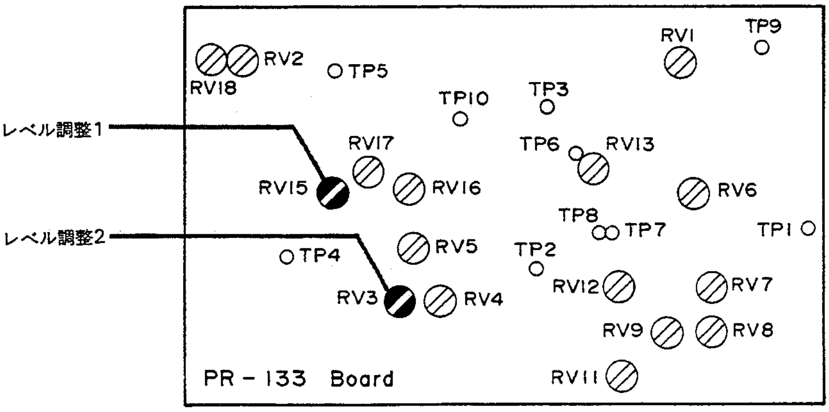
測定器：波形モニター（WFM）
調整点：⊘RV15
規　格：C=100±3 IRE

レベル調整2（γ OFF）
- GAMMA ON/OFFスイッチを“OFF”にします。

測定器：波形モニター（WFM）
調整点：⊘RV3
規　格：D=100±3 IRE






レベル調整1
レベル調整2
RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
PR - 133 Board
RV11

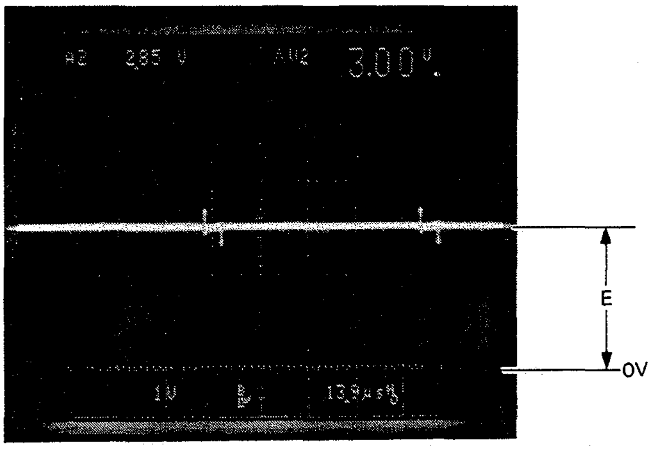
（前面パネル側）

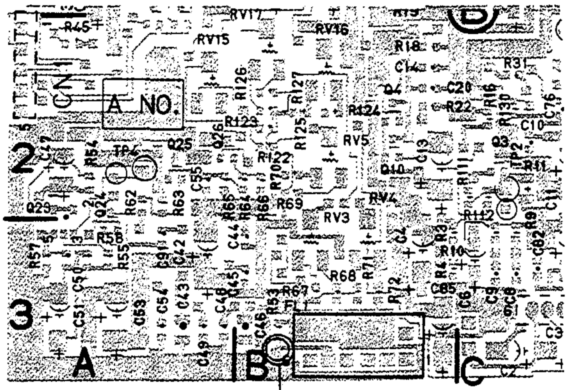
(AGC調整続き)

最大ゲイン調整

- レンズ絞りをクローズにします。

測定器：オシロスコープ
測定点：右図参照（GND：TP1）
調整点：⊘RV2
規　格：E=3.0±0.2V

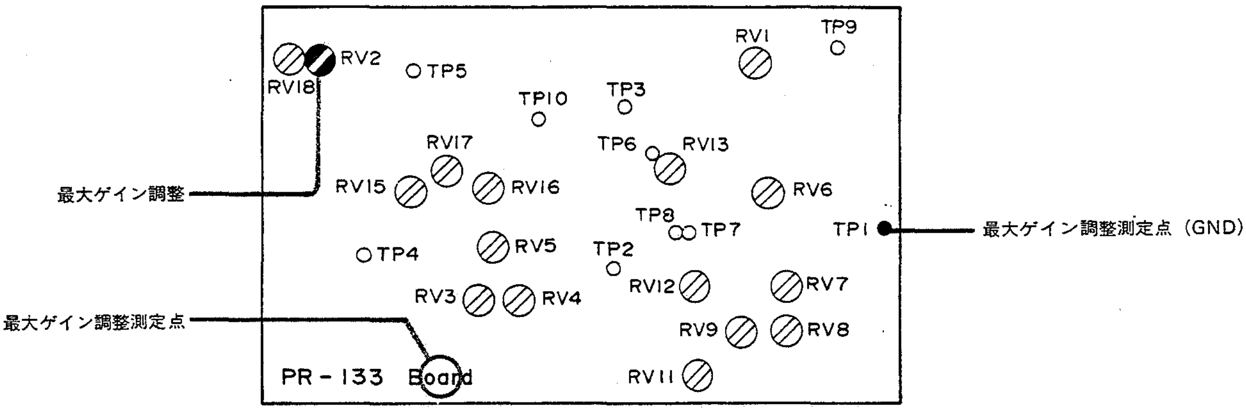




A NO.
2
3
A
B
C
RV17
RV15
RV16
RV5
RV4
RV3
TP4
TP2

ここのスルーホールランドが
最大ゲイン調整測定点

引続き“4-3-8.ホワイトクリップ調整”を行って下さい。



RV2
RV18
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV3
RV4
RV12
RV7
RV9
RV8
RV11
PR-133 Board
最大ゲイン調整
最大ゲイン調整測定点
最大ゲイン調整測定点（GND）

（前面パネル側）

4-3-8. ホワイトクリップ調整

準 備

- 被写体は全白チャート相当です。パターンボックスのみを撮映します。
- レンズ絞りを開放にします。
- カメラコントロールユニットの前面パネルのスイッチを次の様に設定します。

AGC	GAMMA	WHTCLP	INTEG	SCAN	R/RST
ON	OFF	OFF	FRM	2：1	OFF

AGC最小ゲイン調整

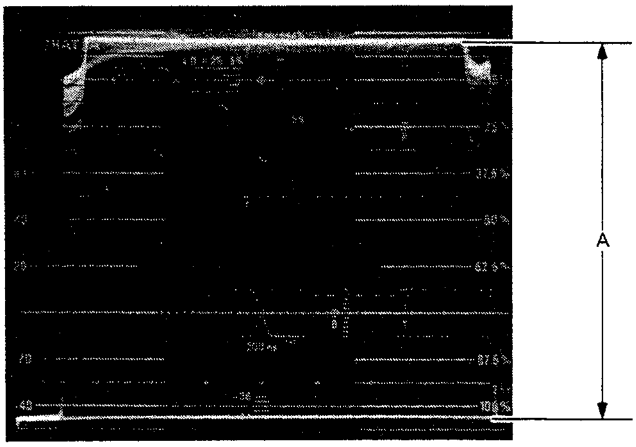
（AGC調整から引続き行う場合のみ行います）

- ⊘RV9を調整して，Aを最大にします。

  測定器：波形モニター（WFM）

  調整点：⊘RV18

  規　格：A＝170±5 IRE



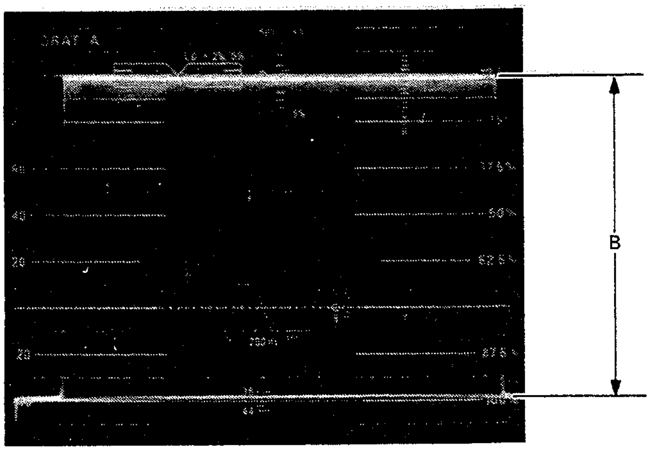
レベル調整1（γ OFF，WC OFF）

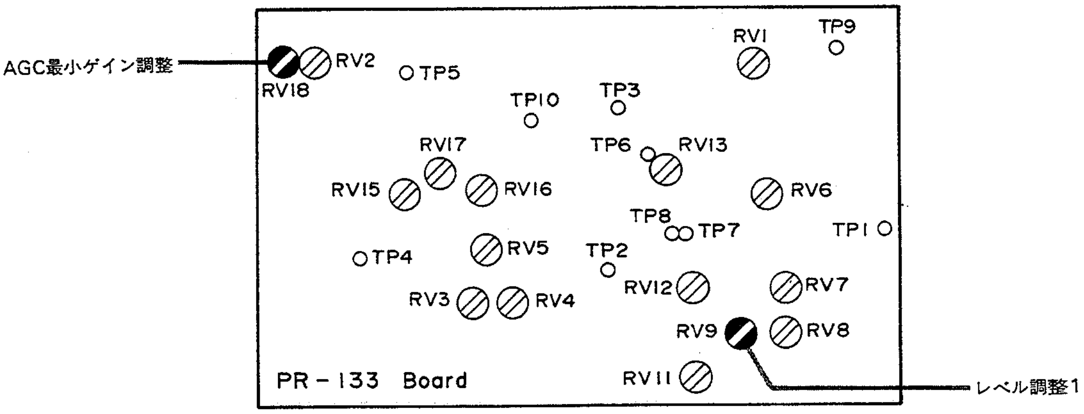
- AGC ON/OFFスイッチを“OFF”にします。

  測定器：波形モニター（WFM）

  調整点：⊘RV9

  規　格：B＝140±5 IRE




AGC最小ゲイン調整
RV18
RV2
TP5
TP10
TP3
RV1
TP9
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
RV12
RV7
RV3
RV4
RV9
RV8
PR－133 Board
RV11
レベル調整1

（前面パネル側）

（ホワイトクリップ調整続き）

レベル調整2（γ OFF, WC ON）
- WHTCLP ON/OFFスイッチを“ON”にします。

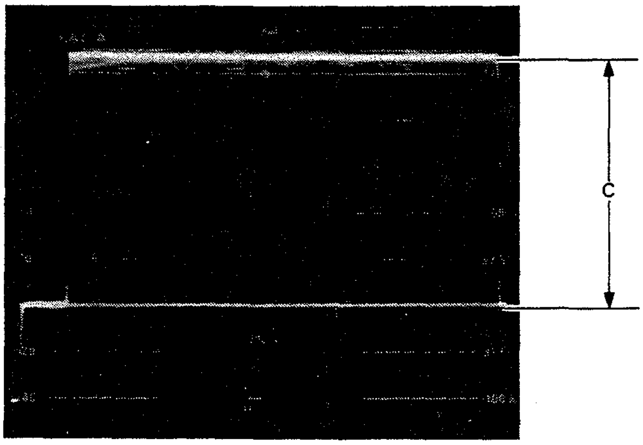
　測定器：波形モニター（WFM）
　調整点：⊘RV8
　規　格：C＝110±5 IRE

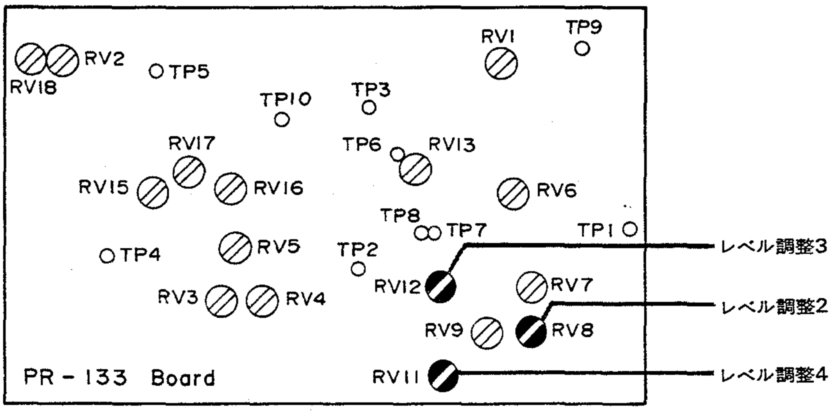
レベル調整3（γ ON, WC ON）
- GAMMA ON/OFFスイッチを“ON”にします。

　測定器：波形モニター（WFM）
　調整点：⊘RV12
　規　格：C＝110±5 IRE

レベル調整4（γ ON, WC OFF）
- WHTCLP ON/OFFスイッチを“OFF”にします。

　測定器：波形モニター（WFM）
　調整点：⊘RV11
　規　格：C＝110±5 IRE

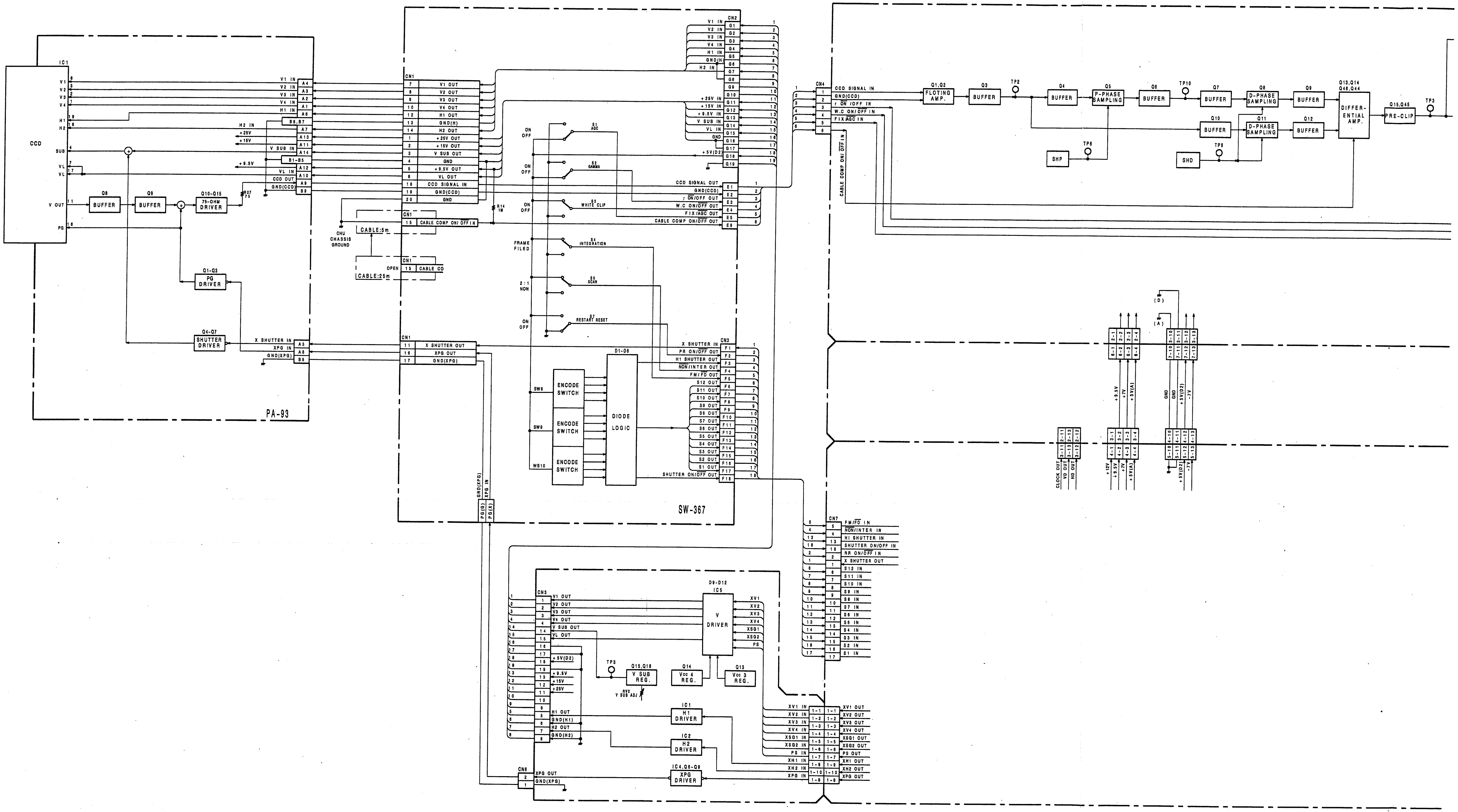


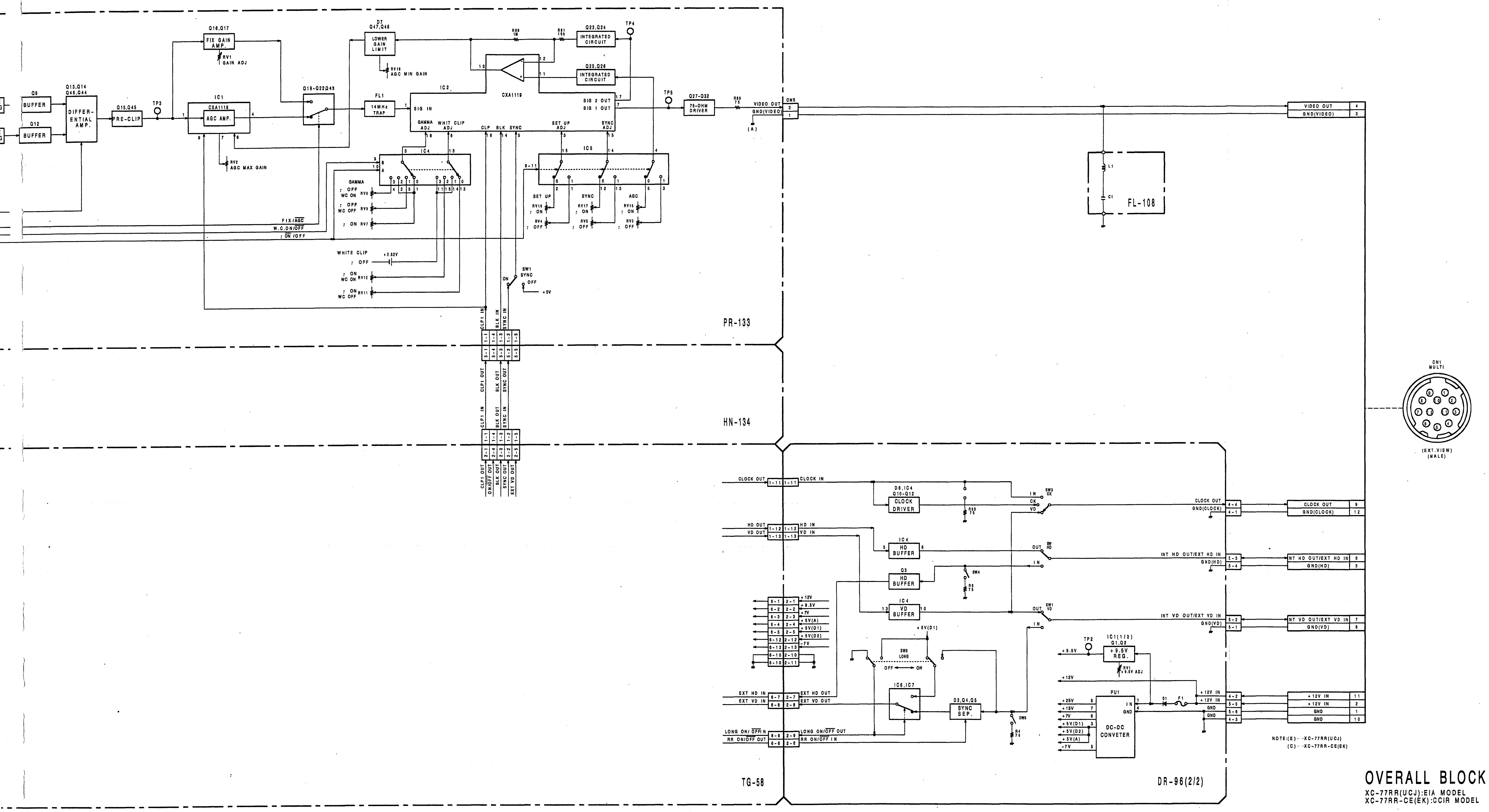

RV18
RV2
TP5
RV1
TP9
TP10
TP3
RV17
TP6
RV13
RV15
RV16
RV6
TP8
TP7
TP1
TP4
RV5
TP2
レベル調整3
RV3
RV4
RV12
RV7
レベル調整2
RV9
RV8
PR－133 Board
RV11
レベル調整4

（前面パネル側）

SECTION A
DIAGRAM

A-1. OVERALL BLOCK DIAGRAM

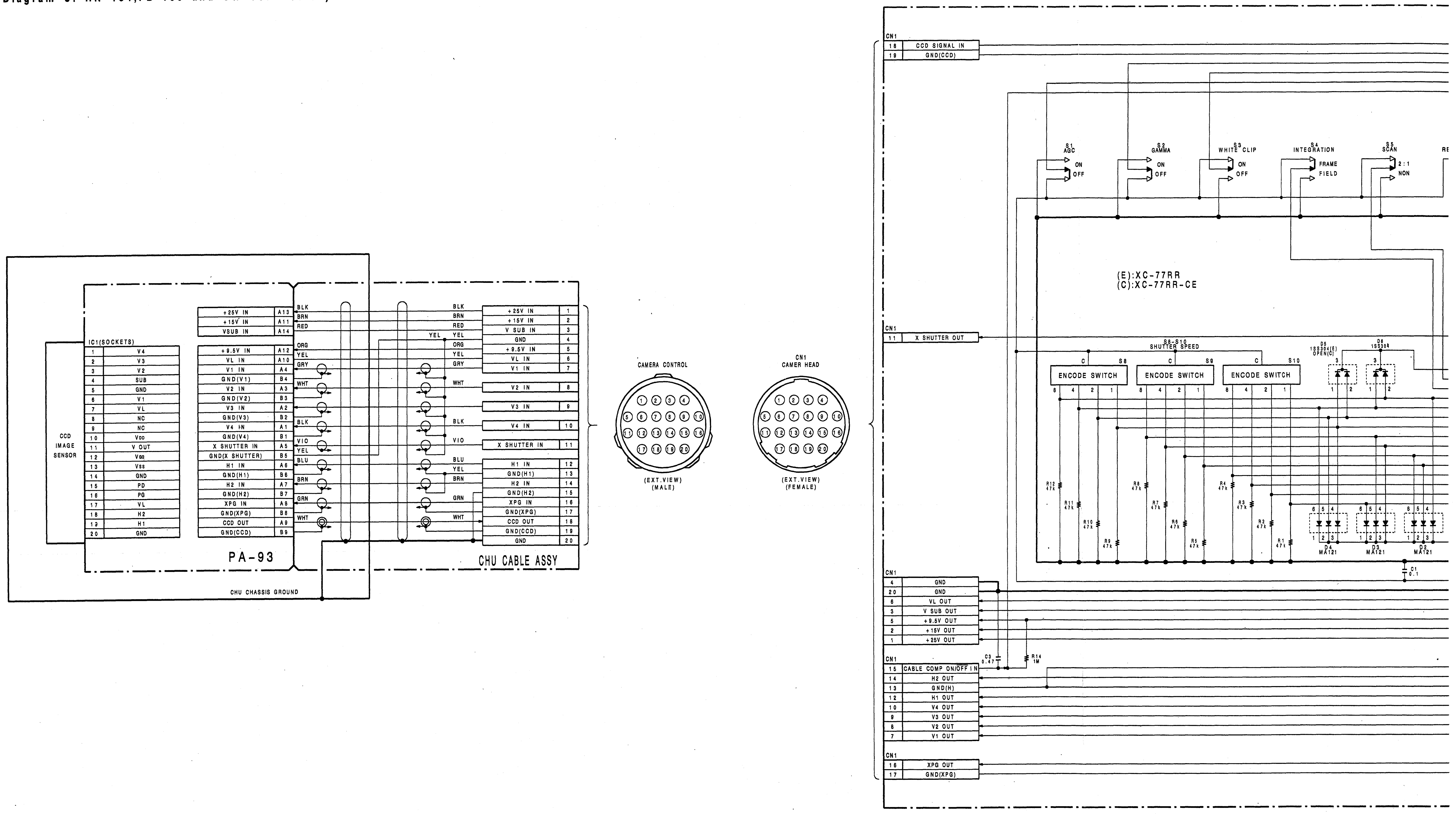

IC1
CCD
V1
V2
V3
V4
H1
H2
SUB
VL
V OUT
PG
Q8
BUFFER
Q9
BUFFER
Q10-Q15
75-OHM DRIVER
Q1-Q3
PG DRIVER
Q4-Q7
SHUTTER DRIVER
PA-93
CN1
V1 OUT
V2 OUT
V3 OUT
V4 OUT
H1 OUT
GND(H)
H2 OUT
+25V OUT
+15V OUT
V SUB OUT
GND
+9.5V OUT
VL OUT
CCD SIGNAL IN
GND(CCD)
CABLE COMP ON/OFF IN
CABLE:5m
CABLE:25m
OPEN
CHU CHASSIS GROUND
X SHUTTER OUT
XPG OUT
GND(XPG)
S1 AGC
S2 GAMMA
S3 WHITE CLIP
S4 INTEGRATION
S5 SCAN
S7 RESTART RESET
ON
OFF
FRAME
FILED
2:1
NON
SW8
SW9
WS10
ENCODE SWITCH
D1-D8
DIODE LOGIC
CN2
CN3
CCD SIGNAL OUT
GND(CCD)
ON/OFF OUT
W.C ON/OFF OUT
FIX/AGC OUT
CABLE COMP ON/OFF OUT
X SHUTTER IN
PR ON/OFF OUT
HI SHUTTER OUT
NON/INTER OUT
FM/FD OUT
SHUTTER ON/OFF OUT
SW-367
CN4
CCD SIGNAL IN
GND(CCD)
ON/OFF IN
W.C ON/OFF IN
FIX/AGC IN
CABLE COMP ON/OFF IN
Q1,Q2
FLOTING AMP.
Q3
BUFFER
TP2
Q4
BUFFER
Q5
P-PHASE SAMPLING
Q6
BUFFER
TP10
Q7
BUFFER
Q8
D-PHASE SAMPLING
Q9
BUFFER
Q10
BUFFER
Q11
D-PHASE SAMPLING
Q12
BUFFER
Q13,Q14 Q43,Q44
DIFFER-ENTIAL AMP.
Q15,Q45
PRE-CLIP
TP3
TP6
TP8
SHP
SHD
CN7
FM/FD IN
NON/INTER IN
HI SHUTTER IN
SHUTTER ON/OFF IN
RR ON/OFF IN
X SHUTTER OUT
S12 IN
S11 IN
S10 IN
S9 IN
S8 IN
S7 IN
S6 IN
S5 IN
S4 IN
S3 IN
S2 IN
S1 IN
CLOCK OUT
VD OUT
HD OUT
+12V
+9.5V
+7V
+5V(A)
GND
+5V(D2)
-7V
D9-D12
IC5
V DRIVER
XV1
XV2
XV3
XV4
XSG1
XSG2
PS
Q15,Q16
V SUB REG.
RV2
V SUB ADJ
Q14
Vcc 4 REG.
Q13
Vcc 3 REG.
IC1
H1 DRIVER
IC2
H2 DRIVER
IC4,Q6-Q9
XPG DRIVER
CN6
XPG OUT
GND(XPG)
XV1 OUT
XV2 OUT
XV3 OUT
XV4 OUT
XSG1 OUT
XSG2 OUT
PS OUT
XH1 OUT
XH2 OUT
XPG OUT

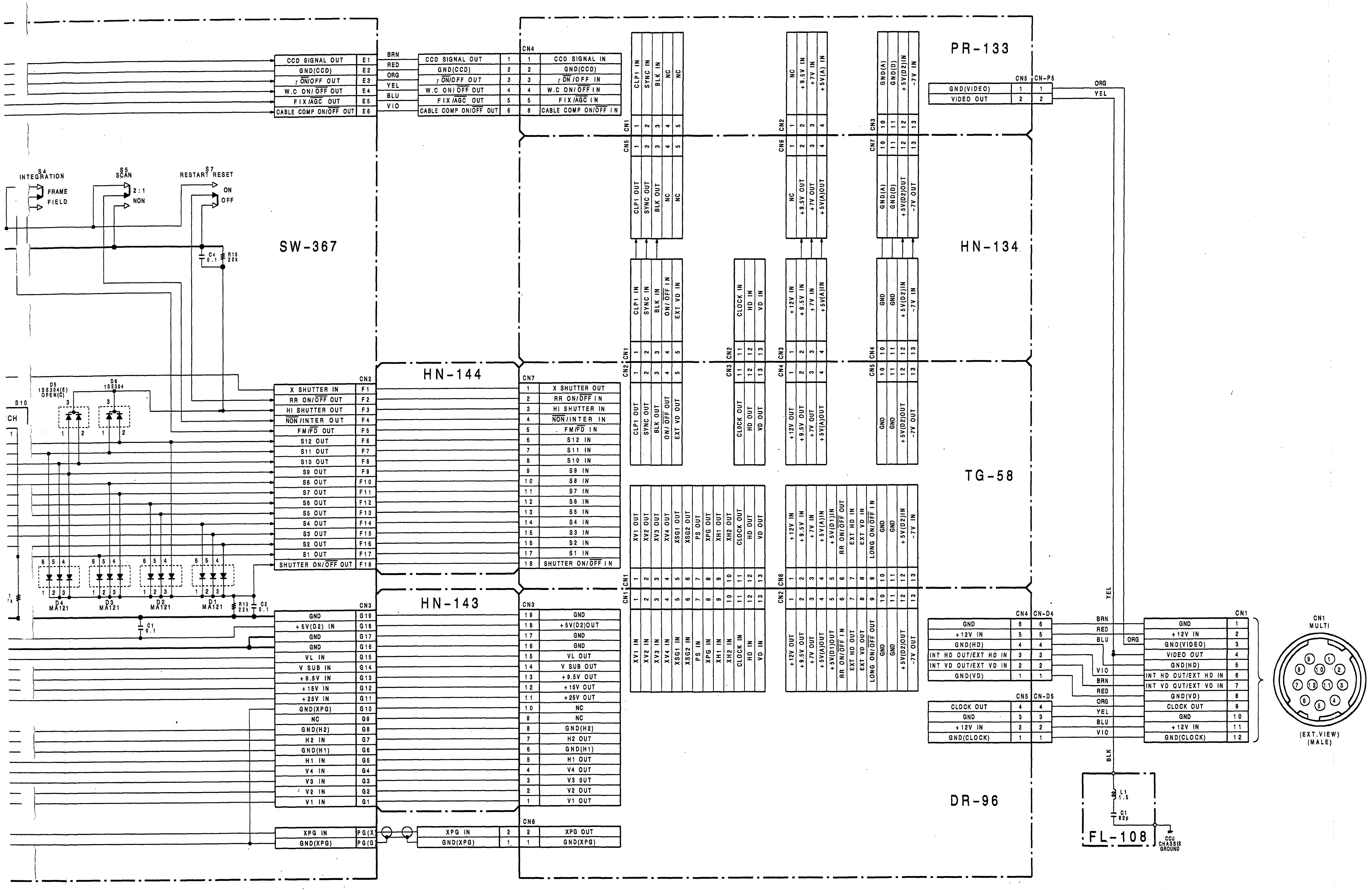

Q9
BUFFER
Q12
BUFFER
Q13,Q14
Q46,Q44
DIFFER-ENTIAL AMP.
Q15,Q45
PRE-CLIP
TP3
Q16,Q17
FIX GAIN AMP.
RV1
GAIN ADJ
IC1
CXA1118
AGC AMP.
RV2
AGC MAX GAIN
Q19-Q22Q43
D7
Q47,Q48
LOWER GAIN LIMIT
RV18
AGC MIN GAIN
FL1
14MHz TRAP
IC2
SIG IN
CXA1119
GAMMA ADJ
WHIT CLIP ADJ
CLP
BLK
SYNC
SET UP ADJ
SYNC ADJ
SIG 2 OUT
SIG 1 OUT
R59
1M
R61
15k
Q23,Q24
INTEGRATED CIRCUIT
Q25,Q26
INTEGRATED CIRCUIT
TP4
TP5
Q27-Q32
75-OHM DRIVER
R63
75
VIDEO OUT
GND(VIDEO)
(A)
CN5
IC4
IC5
GAMMA
OFF
WC ON
RV8
OFF
WC OFF
RV9
ON
RV7
FIX/AGC
W.C.ON/OFF
ON/OFF
SET UP
RV16
ON
RV4
OFF
SYNC
RV17
ON
RV5
OFF
AGC
RV15
ON
RV3
OFF
WHITE CLIP
OFF
+2.82V
ON
WC ON
RV12
ON
WC OFF
RV11
SW1
SYNC
ON
OFF
+5V
CLP1 IN
BLK IN
SYNC IN
PR-133
CLP1 OUT
BLK OUT
SYNC OUT
CLP1 IN
BLK IN
SYNC IN
HN-134
CLP1 OUT
ON/OFF OUT
BLK OUT
SYNC OUT
EXT VD OUT
FL-108
L1
C1
VIDEO OUT
GND(VIDEO)
CN1
MULTI
(EXT.VIEW)
(MALE)
CLOCK OUT
CLOCK IN
D8,IC4
Q10-Q12
CLOCK DRIVER
R55
75
SW3
CK
IN
CK
VD
CLOCK OUT
GND(CLOCK)
CLOCK OUT
GND(CLOCK)
HD OUT
VD OUT
HD IN
VD IN
IC4
HD BUFFER
OUT
IN
SW HD
INT HD OUT/EXT HD IN
GND(HD)
INT HD OUT/EXT HD IN
GND(HD)
Q3
HD BUFFER
SW4
R6
75
IC4
VD BUFFER
SW1
VD
OUT
IN
INT VD OUT/EXT VD IN
GND(VD)
INT VD OUT/EXT VD IN
GND(VD)
+12V
+9.5V
+7V
+5V(A)
+5V(D1)
+5V(D2)
-7V
+5V(D1)
SW6
LONG
OFF
ON
IC6,IC7
D3,Q4,Q5
SYNC SEP.
SW5
R4
75
EXT HD IN
EXT VD IN
EXT HD OUT
EXT VD OUT
LONG ON/OFF IN
RR ON/OFF OUT
LONG ON/OFF OUT
RR ON/OFF IN
TP2
IC1(1/2)
Q1,Q2
+9.5V
+9.5V REG.
RV1
+9.5V ADJ
+12V
PU1
+25V
+15V
+7V
+5V(D1)
+5V(D2)
+5V(A)
-7V
DC-DC CONVETER
IN
GND
D1
F1
+12V IN
+12V IN
GND
GND
+12V IN
+12V IN
GND
GND
TG-58
DR-96(2/2)
NOTE:(E)···XC-77RR(UCJ)
(C)···XC-77RR-CE(EK)

OVERALL BLOCK

XC-77RR(UCJ):EIA MODEL
XC-77RR-CE(EK):CCIR MODEL

A-2. FRAME DIAGRAM
(And Schematic Diagram of HN-134,FL-108 and SW-367 Boards)


CCD IMAGE SENSOR
IC1(SOCKETS)
1 V4
2 V3
3 V2
4 SUB
5 GND
6 V1
7 VL
8 NC
9 NC
10 VDD
11 V OUT
12 VGG
13 VSS
14 GND
15 PD
16 PG
17 VL
18 H2
19 H1
20 GND
+25V IN A13
+15V IN A11
VSUB IN A14
+9.5V IN A12
VL IN A10
V1 IN A4
GND(V1) B4
V2 IN A3
GND(V2) B3
V3 IN A2
GND(V3) B2
V4 IN A1
GND(V4) B1
X SHUTTER IN A5
GND(X SHUTTER) B5
H1 IN A6
GND(H1) B6
H2 IN A7
GND(H2) B7
XPG IN A8
GND(XPG) B8
CCD OUT A9
GND(CCD) B9
BLK
BRN
RED
ORG
YEL
GRY
WHT
VIO
BLU
GRN
PA-93
CHU CHASSIS GROUND
+25V IN 1
+15V IN 2
V SUB IN 3
GND 4
+9.5V IN 5
VL IN 6
V1 IN 7
V2 IN 8
V3 IN 9
V4 IN 10
X SHUTTER IN 11
H1 IN 12
GND(H1) 13
H2 IN 14
GND(H2) 15
XPG IN 16
GND(XPG) 17
CCD OUT 18
GND(CCD) 19
GND 20
CHU CABLE ASSY
CAMERA CONTROL
(EXT.VIEW)
(MALE)
CN1
CAMER HEAD
(EXT.VIEW)
(FEMALE)
CN1
18 CCD SIGNAL IN
19 GND(CCD)
S1 AGC ON OFF
S2 GAMMA ON OFF
S3 WHITE CLIP ON OFF
S4 INTEGRATION FRAME FIELD
S5 SCAN 2:1 NON
(E):XC-77RR
(C):XC-77RR-CE
CN1
11 X SHUTTER OUT
S8-S10 SHUTTER SPEED
ENCODE SWITCH S8
ENCODE SWITCH S9
ENCODE SWITCH S10
D5 1SS304(E) OPEN(C)
D6 1SS304
R12 47k
R11 47k
R10 47k
R9 47k
R8 47k
R7 47k
R6 47k
R5 47k
R4 47k
R3 47k
R2 47k
R1 47k
D4 MA121
D3 MA121
D2 MA121
C1 0.1
CN1
4 GND
20 GND
6 VL OUT
3 V SUB OUT
5 +9.5V OUT
2 +15V OUT
1 +25V OUT
C3 0.47
R14 1M
CN1
15 CABLE COMP ON/OFF IN
14 H2 OUT
13 GND(H)
12 H1 OUT
10 V4 OUT
9 V3 OUT
8 V2 OUT
7 V1 OUT
CN1
16 XPG OUT
17 GND(XPG)


SW-367
HN-144
HN-143
PR-133
HN-134
TG-58
DR-96
FL-108
S4 INTEGRATION
FRAME
FIELD
S5 SCAN
2:1
NON
S7 RESTART RESET
ON
OFF
S10
CCD SIGNAL OUT
GND(CCD)
γ ON/OFF OUT
W.C ON/OFF OUT
FIX/AGC OUT
CABLE COMP ON/OFF OUT
BRN
RED
ORG
YEL
BLU
VIO
CCD SIGNAL IN
X SHUTTER OUT
RR ON/OFF OUT
HI SHUTTER OUT
NON/INTER OUT
FM/FD OUT
SHUTTER ON/OFF OUT
D1 MA121
D2 MA121
D3 MA121
D4 MA121
D5 1SS304(E) OPEN(C)
D6 1SS304
XPG IN
GND(XPG)
XPG OUT
GND(VIDEO)
VIDEO OUT
CLOCK OUT
INT HD OUT/EXT HD IN
INT VD OUT/EXT VD IN
BLK
CCU CHASSIS GROUND
CN1 MULTI
(EXT.VIEW) (MALE)

FRAME

HN-134 BOARD
1-633-852-11

HN-143 FLEXIBLE BOARD
1-633-853-11

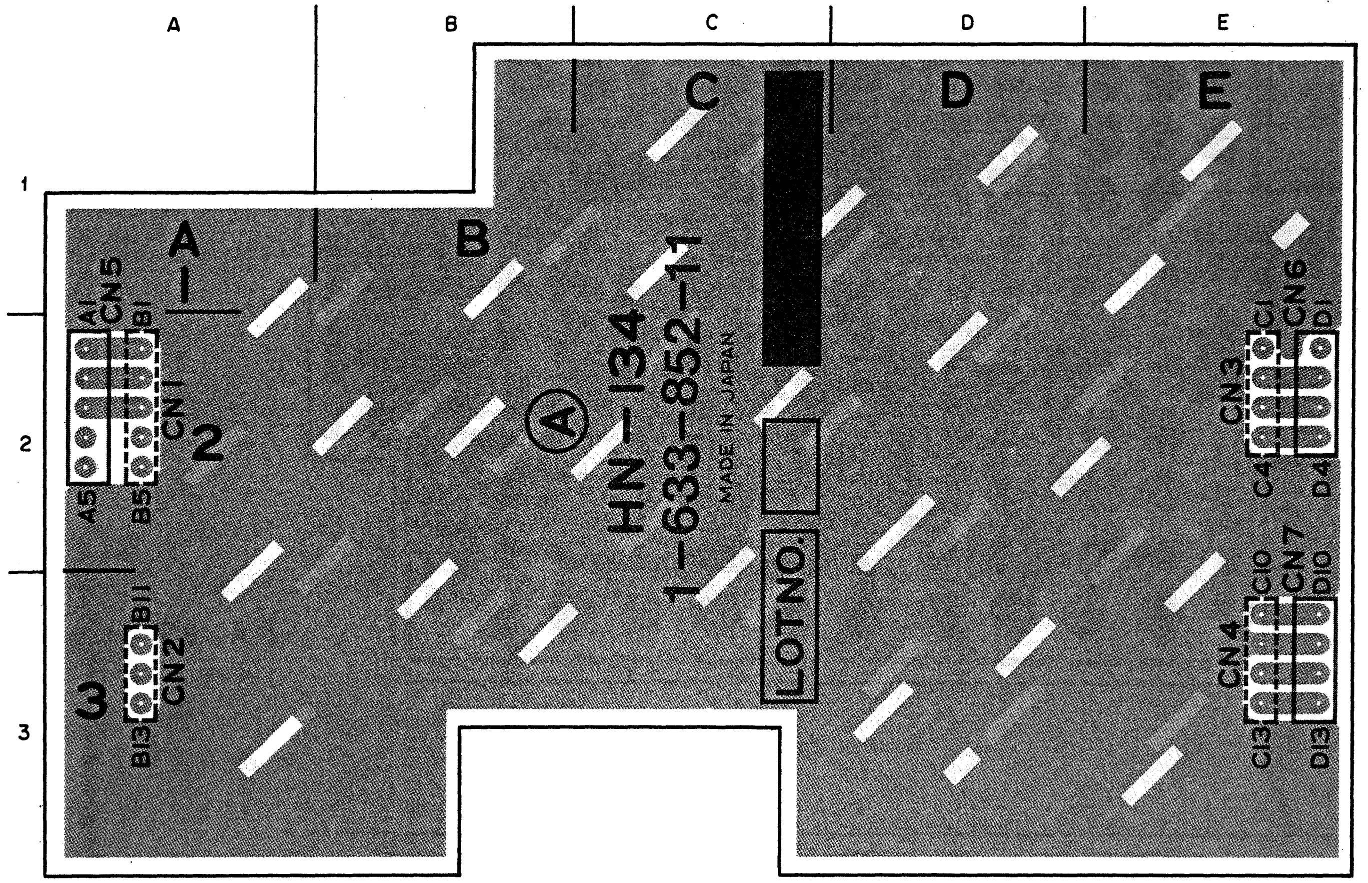
HN-144 FLEXIBLE BOARD
1-633-854-11

FL-108 BOARD
1-634-924-11

SW-367 BOARD
1-633-851-11,12,13

XC-77RR(UCJ):EIA MODEL
XC-77RR-CE(EK):CCIR MODEL

Mounting Diagram of HN-134,FL-108,and SW-367 Boards

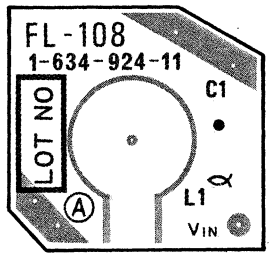

A
B
C
D
E
1
2
3
A1
CN5
B1
CN1
A5
B5
B11
CN2
B13
Ⓐ
HN-134
1-633-852-11
MADE IN JAPAN
LOT NO.
C1
CN6
D1
CN3
C4
D4
C10
CN7
D10
CN4
C13
D13

HN-134 -A SIDE-
1-633-852-11

HN-134 Board Location(1-633-852-11)

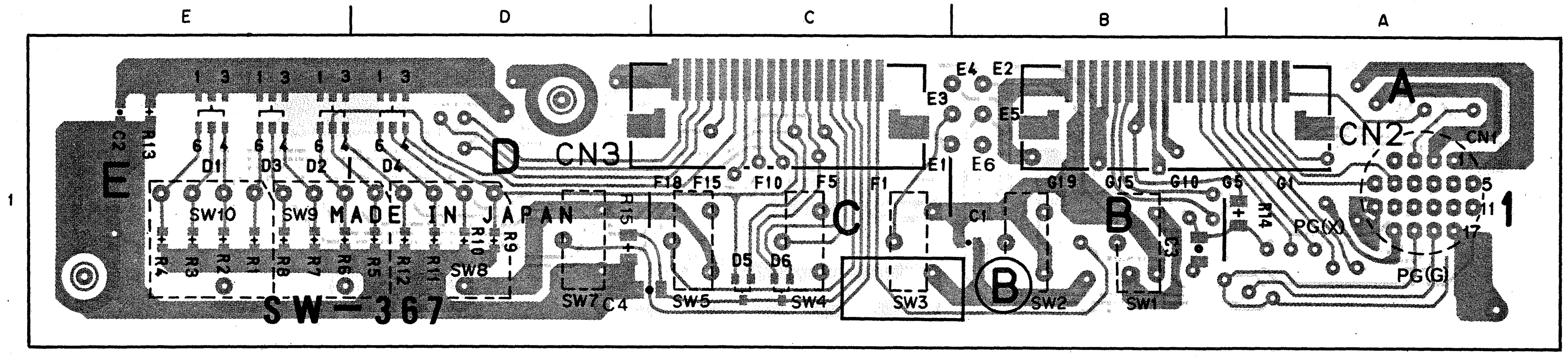
*CN1	A-2
*CN2	A-3
*CN3	E-2
*CN4	E-3
CN5	A-2
CN6	E-2
CN7	E-2

*: B SIDE


FL-108
1-634-924-11
LOT NO
C1
L1
VIN
Ⓐ

FL-108 -A SIDE-
1-634-924-11

Mounting Diagram of SW-367 Board


E
D
C
B
A
1
SW-367
MADE IN JAPAN
CN3
CN2
CN1
D1
D2
D3
D4
D5
D6
SW1
SW2
SW3
SW4
SW5
SW7
SW8
SW9
SW10
C1
C2
C3
C4
E1
E2
E3
E4
E5
E6
F1
F5
F10
F15
F19
G1
G5
G10
G15
G19
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
PG(X)
PG(G)
Ⓑ

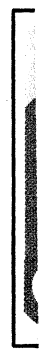
SW-367 -B SIDE-
1-633-851-11,12

SW-367 Board Location(1-633-851-11,12)

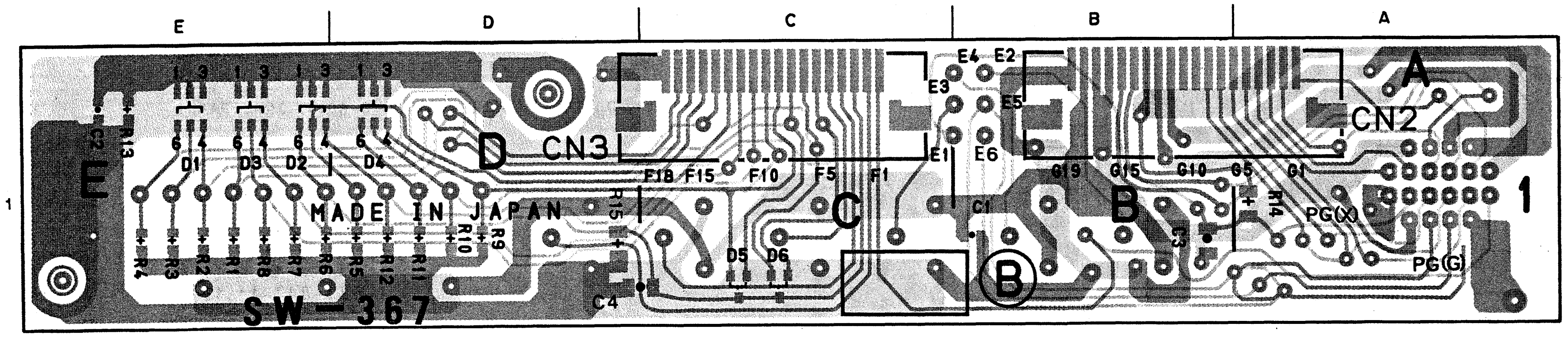
C1	B-1	E1	C-1	R6	E-1	*SW5	C-1
C2	E-1	E2	B-1	R7	E-1	*SW7	C-1
C3	B-1	E3	C-1	R8	E-1	*SW8	D-1
C4	D-1	E4	B-1	R9	D-1	*SW9	E-1
		E5	B-1	R10	D-1	*SW10	E-1
*CN1	A-1	E6	B-1	R11	D-1		
CN2	A-1			R12	D-1		
CN3	D-1	PG(X)	A-1	R13	E-1		
		PG(G)	A-1	R14	A-1		
D1	E-1			R15	D-1		
D2	E-1	R1	E-1				
D3	E-1	R2	E-1	*SW1	B-1		
D4	D-1	R3	E-1	*SW2	B-1		
D5	C-1	R4	E-1	*SW3	C-1		
D6	C-1	R5	D-1	*SW4	C-1		

*: A SIDE

Moun



Mounting Diagram of SW-367 Board


E
D
C
B
A
1
1
E
D
C
B
A
B
CN3
CN2
1 3
6 4
D1
D2
D3
D4
D5
D6
C1
C2
C3
C4
E1
E2
E3
E4
E5
E6
F18
F15
F10
F5
F1
G19
G15
G10
G5
G1
PG(X)
PG(G)
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
MADE IN JAPAN
SW-367

SW-367 -B SIDE-

1-633-851-13

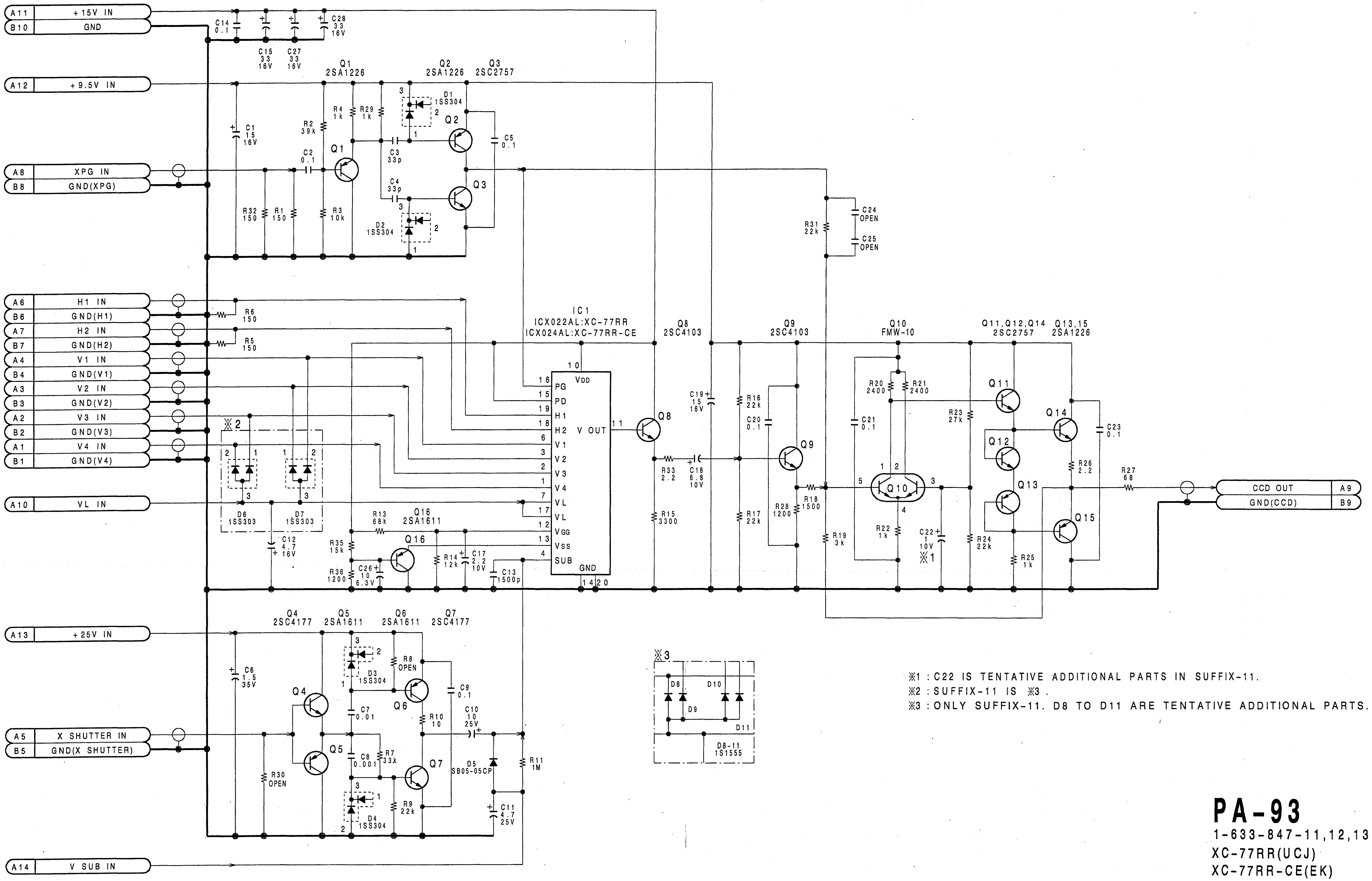
SW-367 Board Location(1-633-851-13)

C1	B-1	E1	C-1	R6	E-1	*SW5	C-1
C2	E-1	E2	B-1	R7	E-1	*SW7	C-1
C3	B-1	E3	C-1	R8	E-1	*SW8	D-1
C4	D-1	E4	B-1	R9	D-1	*SW9	E-1
		E5	B-1	R10	D-1	*SW10	E-1
CN2	A-1	E6	B-1	R11	D-1		
CN3	D-1			R12	D-1		
		PG(X)	A-1	R13	E-1		
D1	E-1	PG(G)	A-1	R14	A-1		
D2	E-1			R15	D-1		
D3	E-1	R1	E-1				
D4	D-1	R2	E-1	*SW1	B-1		
D5	C-1	R3	E-1	*SW2	B-1		
D6	C-1	R4	E-1	*SW3	C-1		
		R5	D-1	*SW4	C-1		

*: A SIDE

A-3. PA-93 BOARD

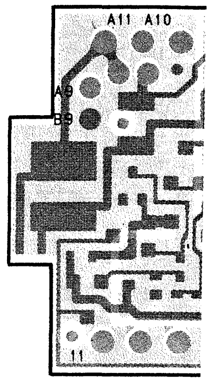
Scheamatic Diagram


A11 +15V IN
B10 GND
A12 +9.5V IN
A8 XPG IN
B8 GND(XPG)
A6 H1 IN
B6 GND(H1)
A7 H2 IN
B7 GND(H2)
A4 V1 IN
B4 GND(V1)
A3 V2 IN
B3 GND(V2)
A2 V3 IN
B2 GND(V3)
A1 V4 IN
B1 GND(V4)
A10 VL IN
A13 +25V IN
A5 X SHUTTER IN
B5 GND(X SHUTTER)
A14 V SUB IN
C14 0.1
C15 33 16V
C27 33 16V
C28 33 16V
Q1 2SA1226
Q2 2SA1226
Q3 2SC2757
D1 1SS304
D2 1SS304
C1 15 16V
R2 39k
R4 1k
R29 1k
C2 0.1
C3 33p
C4 33p
C5 0.1
R32 150
R1 150
R3 10k
C24 OPEN
C25 OPEN
R31 22k
R6 150
R5 150
※2
D6 1SS303
D7 1SS303
C12 4.7 16V
IC1
ICX022AL:XC-77RR
ICX024AL:XC-77RR-CE
PG PD H1 H2 V1 V2 V3 V4 VL VL VGG VSS SUB VDD V OUT GND
R13 68k
Q16 2SA1611
R35 15k
R36 1200
C26 10 6.3V
R14 12k
C17 2.2 10V
C13 1500p
Q8 2SC4103
R33 2.2
C18 6.8 10V
C19 15 16V
R15 3300
Q9 2SC4103
R16 22k
C20 0.1
R17 22k
R28 1200
R18 1500
R19 3k
Q10 FMW-10
R20 2400
R21 2400
C21 0.1
R22 1k
C22 1 10V ※1
Q11,Q12,Q14 2SC2757
Q13,15 2SA1226
R23 27k
R24 22k
R25 1k
R26 2.2
C23 0.1
R27 68
CCD OUT A9
GND(CCD) B9
Q4 2SC4177
Q5 2SA1611
Q6 2SA1611
Q7 2SC4177
C6 1.5 35V
D3 1SS304
D4 1SS304
R8 OPEN
C9 0.1
C7 0.01
C8 0.001
R7 33k
R10 10
C10 10 25V
D5 SB05-05CP
R11 1M
R30 OPEN
R9 22k
C11 4.7 25V
※3
D8 D9 D10 D11
D8-11 1S1555

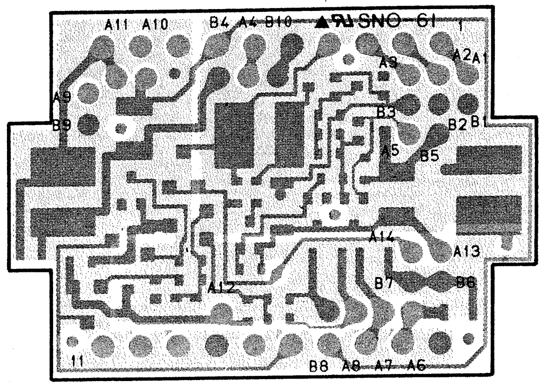
※1 : C22 IS TENTATIVE ADDITIONAL PARTS IN SUFFIX-11.
※2 : SUFFIX-11 IS ※3 .
※3 : ONLY SUFFIX-11. D8 TO D11 ARE TENTATIVE ADDITIONAL PARTS.

PA-93
1-633-847-11,12,13
XC-77RR(UCJ)
XC-77RR-CE(EK)

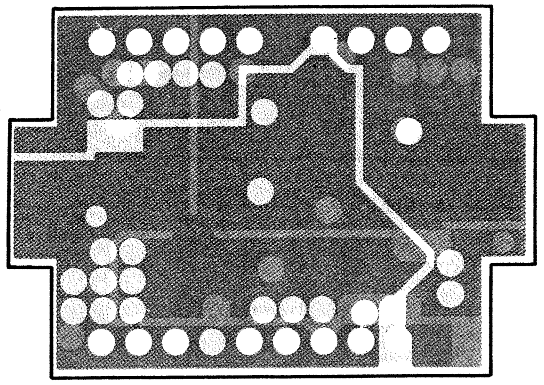
Mounting Dia


A11 A10
A9
B9
11

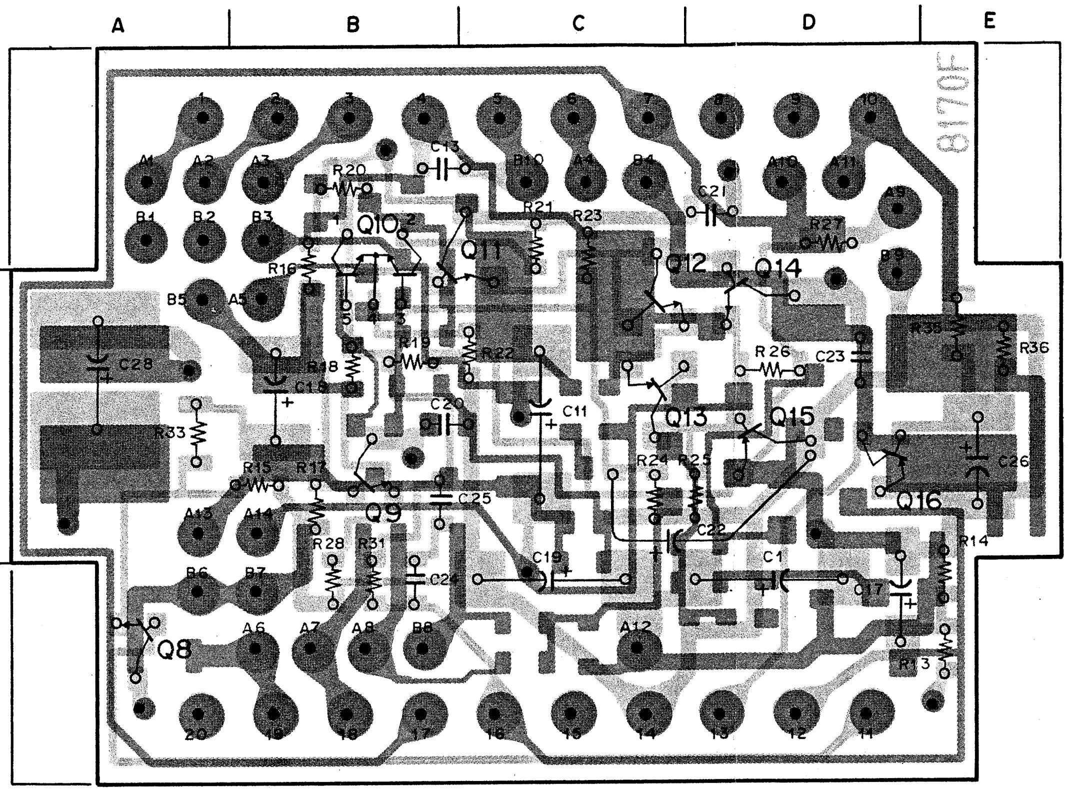
Mounting Diagram


A11 A10
B4 A4 B10
SNO-61
A9
B9
A3
A2
A1
B3
B2
B1
A5
B5
A14
A13
A12
B7
B6
11
B8 A8 A7 A6

PA-93 -B SIDE-
1-633-847-11



PA-93 -B SIDE-
1-633-847-11

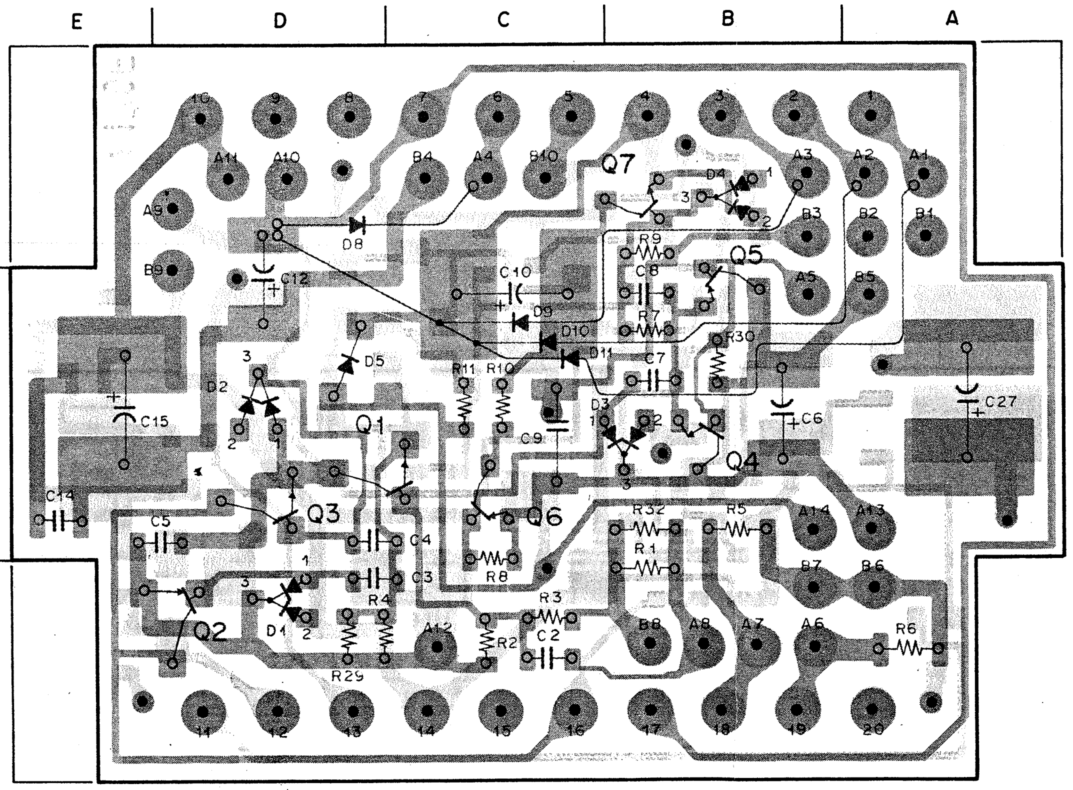

A
B
C
D
E
1
2
3
8170F
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15
Q16

PA-93 -A SIDE-
1-633-847-11

PA-93 Board Location (1-633-847-11)

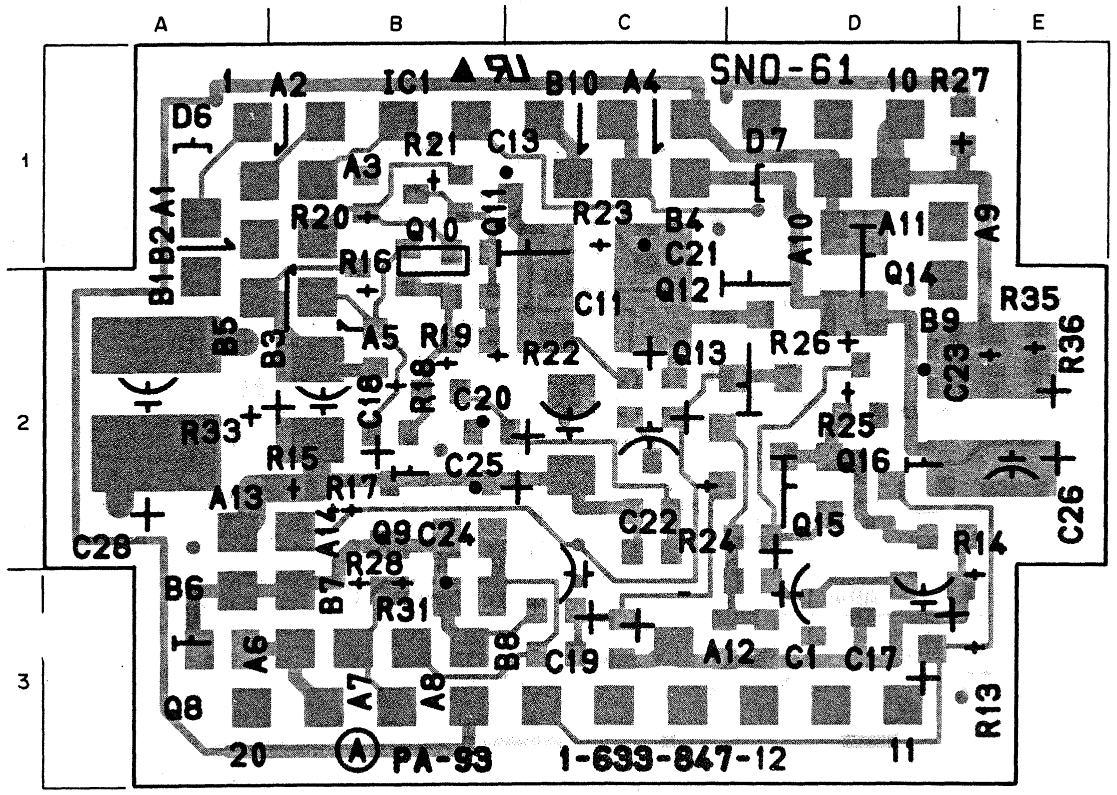
*A1	A-1	C1	D-3	*D1	D-3	*R1	B-3	*R29	D-3
*A2	A-1	*C2	C-3	*D2	D-2	*R2	C-3	*R30	B-2
*A3	B-1	*C3	D-3	*D3	B-2	*R3	C-3	R31	B-3
*A4	C-1	*C4	D-2	*D4	B-1	*R4	C-3	*R32	B-2
*A5	B-2	*C5	E-2	*D5	D-2	*R5	B-2	*R33	B-2
*A6	B-3	*C6	B-2	*D8	D-1	*R6	A-3	R34	A-2
*A7	B-3	*C7	B-2	*D9	C-2	*R7	B-2	R35	E-2
*A8	B-3	*C8	B-2	*D10	C-2	*R8	C-2	R36	E-2
*A9	D-1	*C9	C-2	*D11	C-2	*R9	B-1		
*A10	D-1	*C10	C-2			*R10	C-2		
*A11	D-1	C11	C-2	*Q1	C-2	*R11	C-2		
*A12	C-3	*C12	D-2	*Q2	D-3	R13	E-3		
*A13	A-2	C13	B-1	*Q3	D-2	R14	E-3		
*A14	A-2	*C14	E-2	*Q4	B-2	R15	B-2		
		*C15	E-2	*Q5	B-2	R16	B-1		
		C17	D-3	*Q6	C-2	R17	B-2		
*B1	A-1	C18	B-2	*Q7	B-1	R18	B-2		
*B2	A-2	C19	C-3	Q8	A-3	R19	B-2		
*B3	B-1	C20	B-2	Q9	B-2	R20	B-1		
*B4	C-1	C21	D-2	Q10	B-1	R21	C-1		
*B5	A-2	C22	D-2	Q11	C-1	R22	C-2		
*B6	A-3	C23	D-2	Q12	C-2	R23	C-1		
*B7	B-3	C24	B-3	Q13	C-2	R24	C-2		
*B8	B-3	C25	B-2	Q14	D-2	R25	C-2		
*B9	D-1	C26	E-2	Q15	D-2	R26	D-2		
*B10	C-1	*C27	A-2	Q16	D-2	R27	D-1		
		C28	A-2			R28	B-3		

*: B SIDE

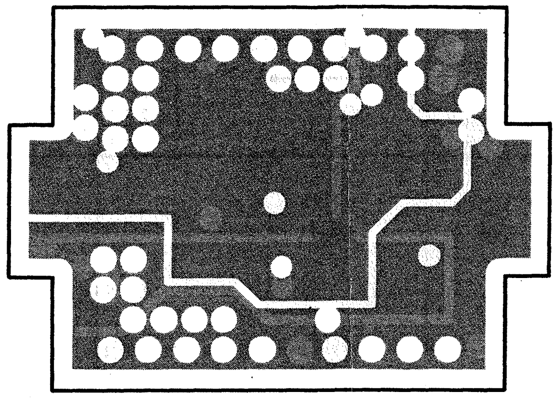

E
D
C
B
A
1
2
3
Q1
Q2
Q3
Q4
Q5
Q6
Q7

PA-93 -B SIDE-
1-633-847-11

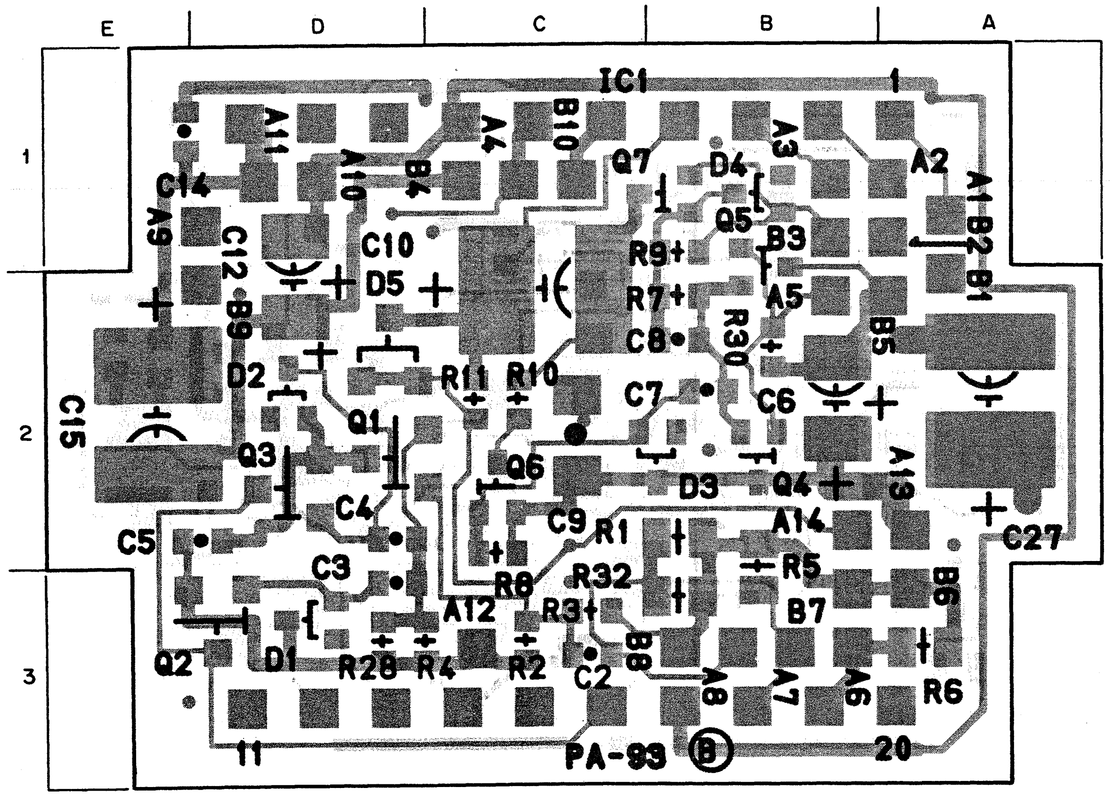
Mounting Diagram


A
B
C
D
E
1
2
3
SNO-61
IC1
1
A2
B10
A4
10
R27
D6
R21
C13
D7
A3
R20
Q10
Q11
R23
B4
C21
A10
A11
A9
B1B2A1
R16
Q12
Q14
C11
R35
B5
B3
A5
R19
R22
Q13
R26
B9
C23
R36
C18
R18
C20
R33
R25
R15
C25
Q16
A13
R17
C26
C22
R24
Q15
R14
C28
A14
Q9
C24
R28
B6
B7
R31
A6
B8
C19
A12
C1
C17
A7
A8
Q8
R13
20
Ⓐ PA-93
1-633-847-12
11

PA-93 -A SIDE-
1-633-847-12



PA-93 -B SIDE-
1-633-847-12

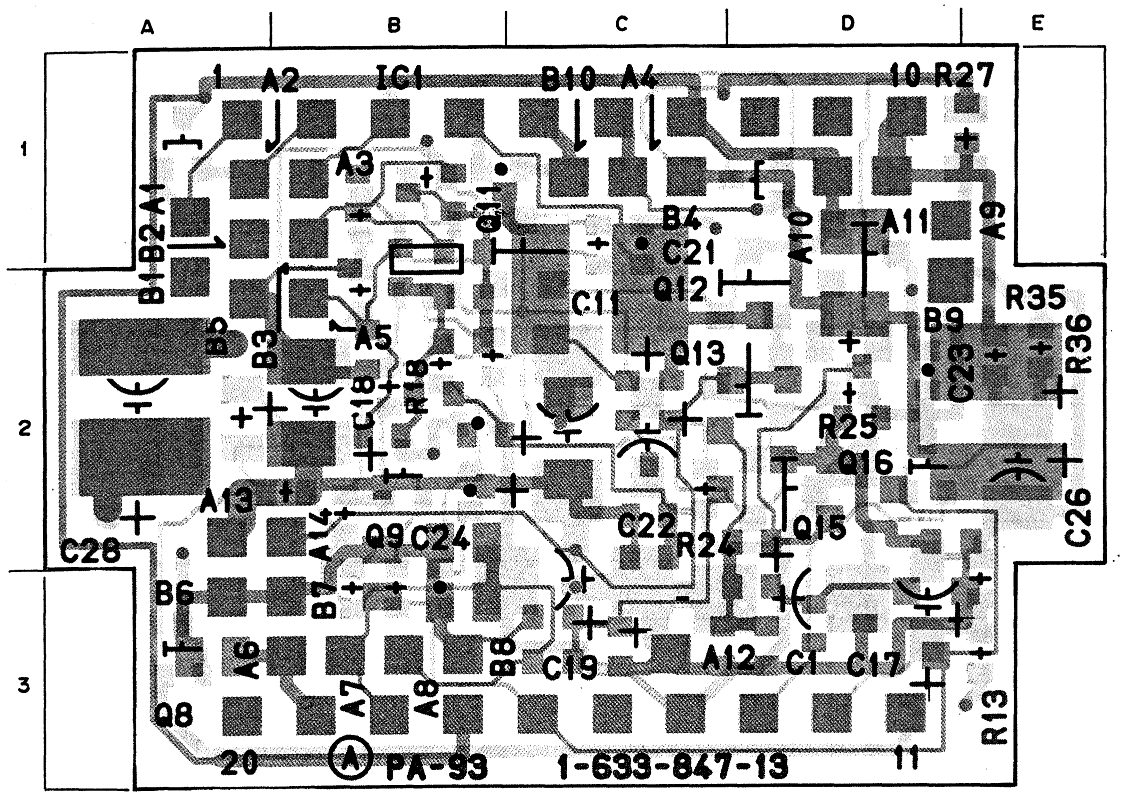

E
D
C
B
A
1
2
3
IC1
1
A11
A10
A4
B10
A3
A2
C14
B4
Q7
D4
A1B2B1
A9
C12
C10
Q5
B3
B9
D5
R9
R7
A5
R30
C8
B5
C15
D2
R11
R10
C7
C6
Q3
Q1
Q6
D3
Q4
A13
C4
A14
C27
C5
C3
C9
R1
R5
R8
R32
B6
A12
R3
B7
Q2
D1
R28
R4
R2
C2
B8
A8
A7
A6
R6
11
PA-93 Ⓑ
20

PA-93 -B SIDE-
1-633-847-12

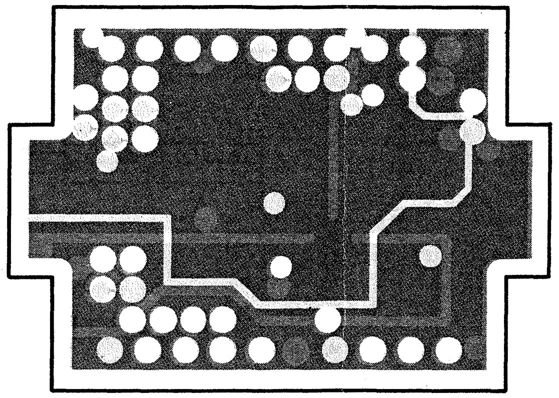
PA-93 Board Location (1-633-847-12)

*A1	A-1	C1	D-3	*D1	D-3	*R2	C-3	*R30	B-2
*A2	A-1	*C2	C-3	*D2	D-2	*R3	C-3	R31	B-3
*A3	B-1	*C3	D-3	*D3	B-2	*R4	C-3	*R32	B-3
*A4	C-1	*C4	D-2	*D4	B-1	*R5	B-3	*R33	B-2
*A5	B-2	*C5	E-2	*D5	D-2	*R6	A-3	R34	A-2
*A6	B-3	*C6	B-2	D6	A-1	*R7	B-2	R35	E-2
*A7	B-3	*C7	B-2	D7	D-1	*R8	C-2	R36	E-2
*A8	B-3	*C8	B-2			*R9	B-1		
*A9	D-1	*C9	C-2	*Q1	C-2	*R10	C-2		
*A10	D-1	*C10	C-2	*Q2	D-3	*R11	C-2		
*A11	D-1	C11	D-2	*Q3	D-2	R13	E-3		
*A12	C-3	*C12	D-1	*Q4	B-2	R14	E-3		
*A13	A-2	C13	C-1	*Q5	B-1	R15	B-2		
*A14	A-2	*C14	E-1	*Q6	C-2	R16	B-2		
		*C15	E-2	*Q7	B-1	R17	B-2		
		C17	D-3	Q8	A-3	R18	B-2		
*B1	A-1	C18	B-2	Q9	B-2	R19	B-2		
*B2	A-2	C19	C-3	Q10	B-1	R20	B-1		
*B3	B-1	C20	B-2	Q11	C-1	R21	B-1		
*B4	C-1	C21	C-1	Q12	D-2	R22	C-2		
*B5	A-2	C22	D-2	Q13	D-2	R23	C-1		
*B6	A-3	C23	D-2	Q14	D-1	R24	C-2		
*B7	B-3	C24	B-3	Q15	D-2	R25	C-2		
*B8	B-3	C25	B-2	Q16	D-2	R26	D-2		
*B9	D-1	C26	E-2			R27	D-1		
*B10	C-1	*C27	A-2			R28	B-3		
		C28	A-2	*R1	B-2	*R29	D-3		

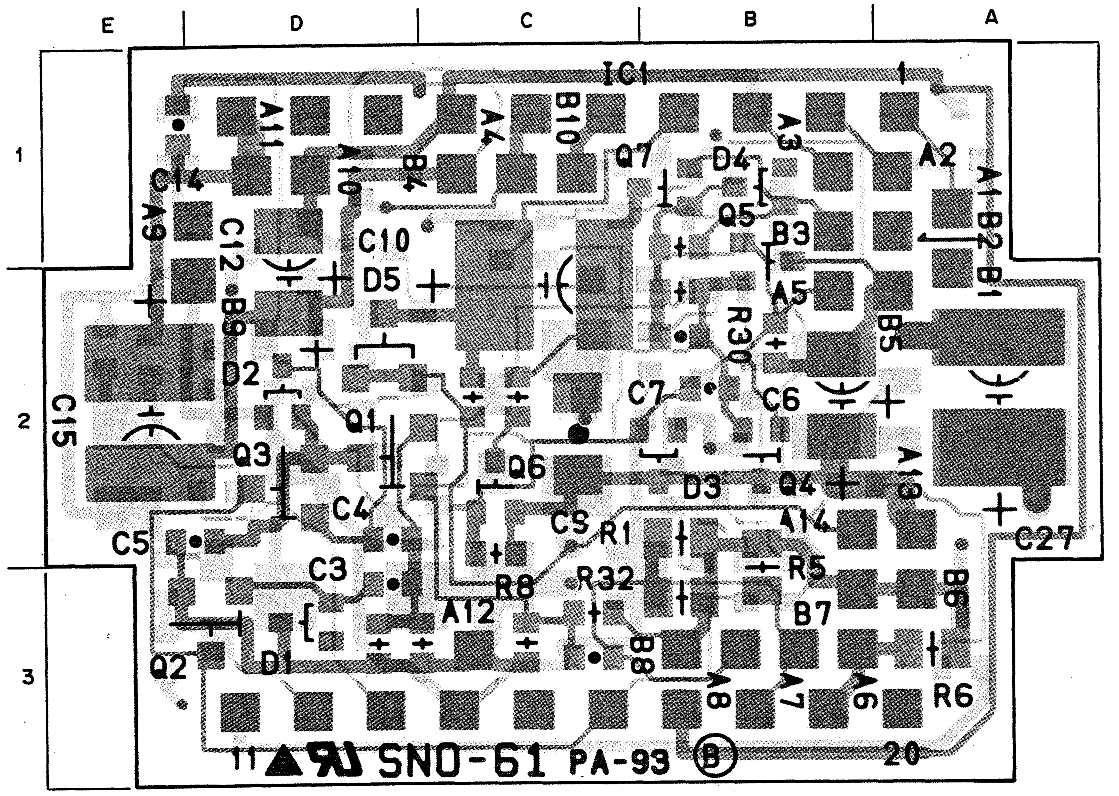
*: B SIDE


A
B
C
D
E
1
2
3
1
A2
IC1
B10
A4
10
R27
A1
B1B2
A3
Q11
B4
C21
A10
A11
A9
C11
Q12
R35
B5
B3
A5
Q13
B9
C23
R36
C18
R18
R25
Q16
A13
C28
A14
Q9
C24
C22
R24
Q15
C26
B6
B7
B8
C19
A12
C1
C17
A6
A7
A8
Q8
R13
20
Ⓐ PA-93
1-633-847-13
11

PA-93 -A SIDE-
1-633-847-13



PA-93 -B SIDE-
1-633-847-13

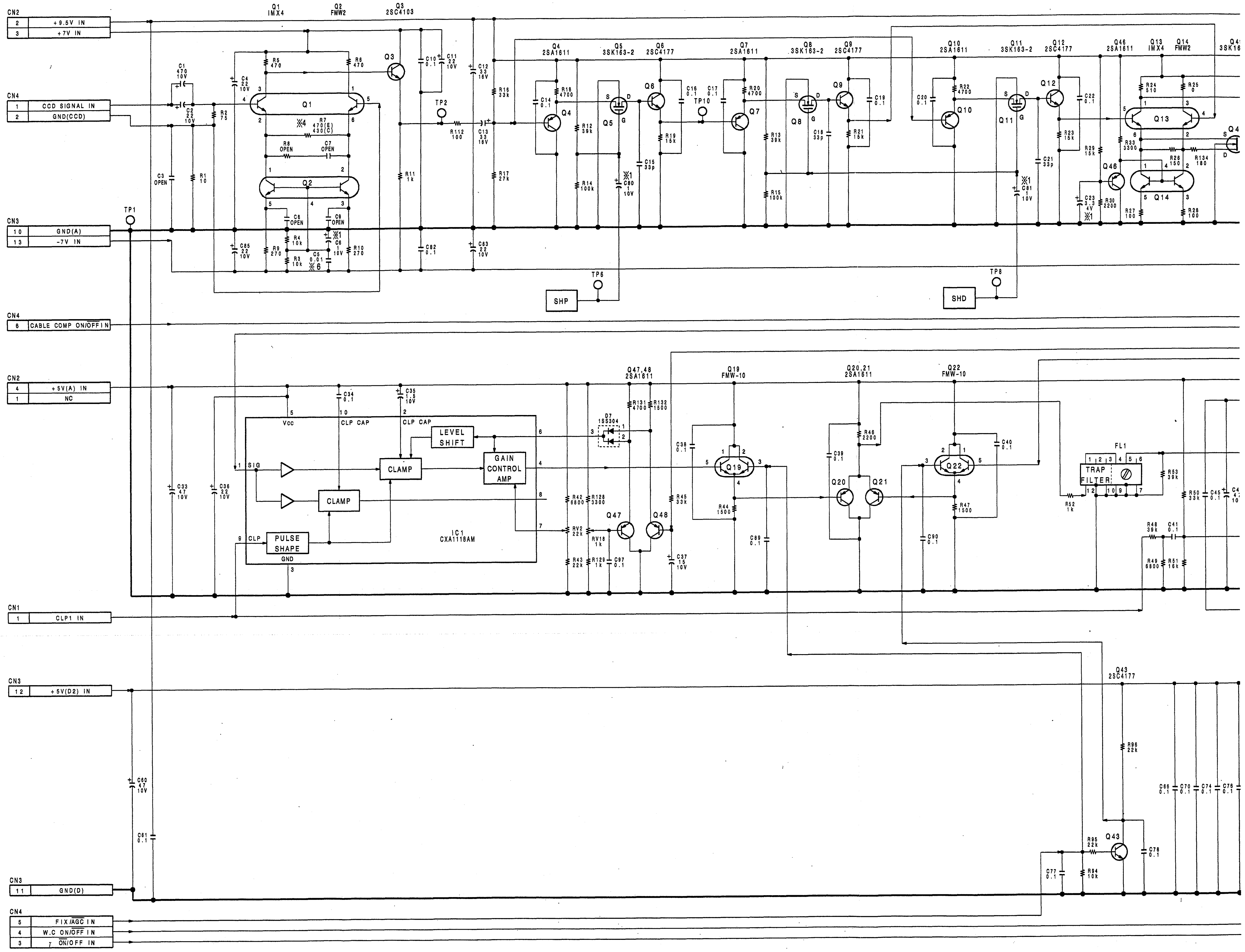

E
D
C
B
A
1
2
3
IC1
1
A11
A10
A4
B10
A3
A2
B4
Q7
D4
C14
A9
C12
B9
C10
Q5
B3
A1 B2 B1
D5
A5
R30
B5
D2
C15
Q1
C7
C6
Q3
Q6
A13
C4
D3
Q4
C5
C3
C8
R1
A14
C27
R8
R32
R5
A12
B7
B6
Q2
D1
B8
A8
A7
A6
R6
11
SNO-61 PA-93 Ⓑ
20

PA-93 -B SIDE-
1-633-847-13

PA-93 Board Location (1-633-847-13)

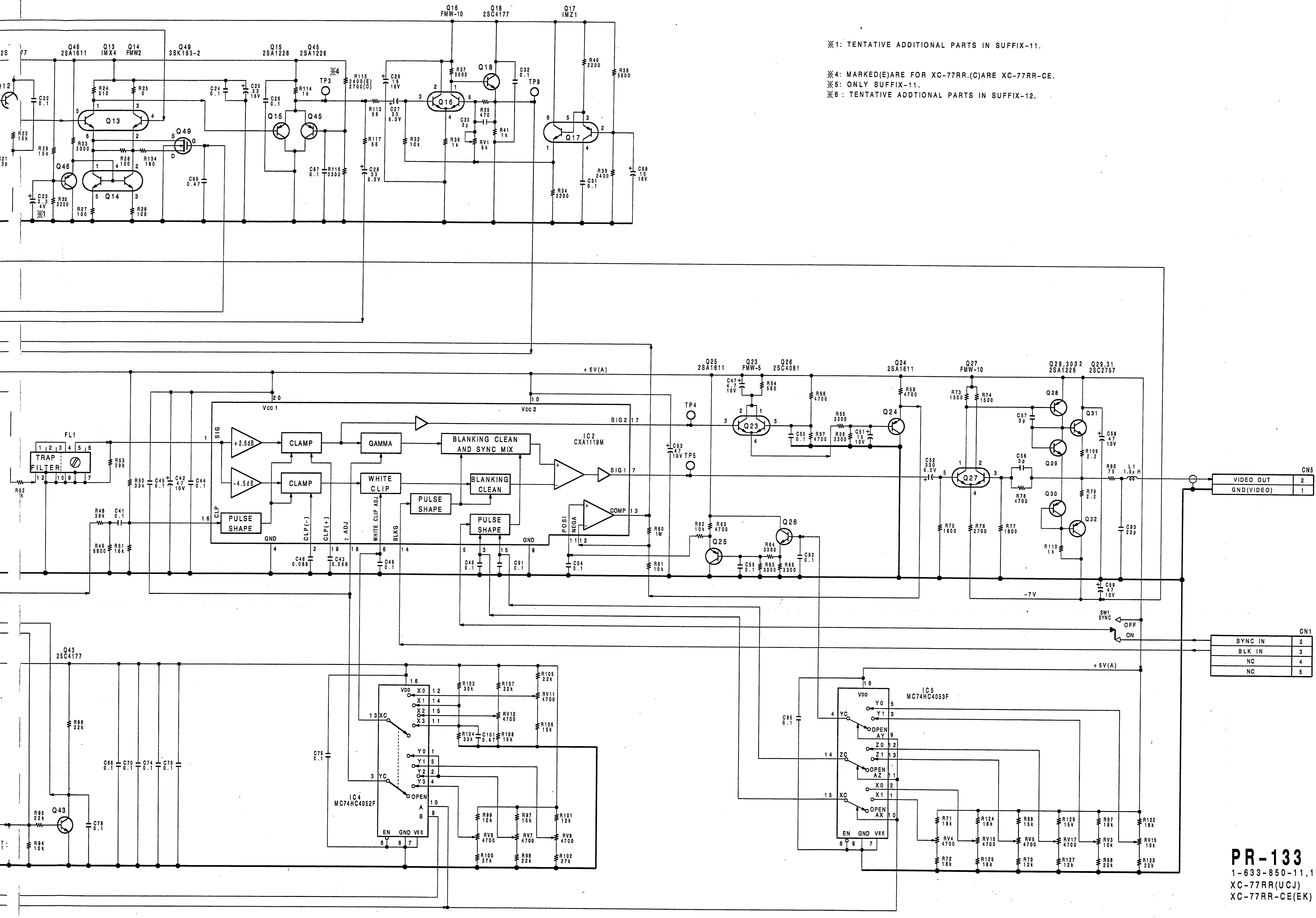
A1	A-1	C1	D-3	*D1	D-3	*R3	C-3	*R32	C-3
A2	A-1	*C2	C-3	*D2	D-2	*R4	C-3	*R33	B-2
A3	B-1	*C3	D-3	*D3	B-2	*R5	B-3	R35	E-2
A4	C-1	*C4	D-2	*D4	B-1	*R6	A-3	R36	E-2
A5	B-2	*C5	E-2	*D5	D-2	*R7	B-2		
A6	B-3	*C6	B-2	D6	A-1	*R8	C-2		
A7	B-3	*C7	B-2	D7	D-1	*R9	B-1		
A8	B-3	*C8	B-2			*R10	C-2		
A9	E-1	*C9	C-2	*Q1	D-2	*R11	C-2		
A10	D-1	*C10	D-1	*Q2	D-3	R13	E-3		
A11	D-1	C11	C-2	*Q3	D-2	R14	E-3		
A12	C-3	*C12	D-1	*Q4	B-2	R15	B-2		
A13	A-2	C13	C-1	*Q5	B-1	R16	B-2		
A14	A-2	*C14	E-1	*Q6	C-2	R17	B-2		
		*C15	E-2	*Q7	B-1	R18	B-2		
		C17	D-3	Q8	A-3	R19	B-2		
B1	A-2	C18	B-2	Q9	B-2	R20	B-1		
B2	A-1	C19	C-3	Q10	B-1	R21	B-1		
B3	B-1	C20	B-2	Q11	C-1	R22	C-2		
B4	C-1	C21	C-1	Q12	D-2	R23	C-1		
B5	A-2	C22	C-2	Q13	D-2	R24	C-2		
B6	A-3	C23	D-2	Q14	D-1	R25	D-2		
B7	B-3	C24	B-3	Q15	D-2	R26	D-2		
B8	B-3	C25	B-2	Q16	D-2	R27	D-1		
B9	D-2	C26	E-2			R28	B-3		
B10	C-1	*C27	A-2	*R1	B-2	*R30	B-2		
		C28	A-2	R2	C-3	R31	B-3	*: B SIDE	

A-4. PR-133 BOARD
Schematic Diagram


CN2
+9.5V IN
+7V IN
CN4
CCD SIGNAL IN
GND(CCD)
CN3
GND(A)
-7V IN
CN4
CABLE COMP ON/OFF IN
CN2
+5V(A) IN
NC
CN1
CLP1 IN
CN3
+5V(D2) IN
CN3
GND(D)
CN4
FIX/AGC IN
W.C ON/OFF IN
γ ON/OFF IN
Q1 IMX4
Q2 FMW2
Q3 2SC4103
Q4 2SA1611
Q5 3SK163-2
Q6 2SC4177
Q7 2SA1611
Q8 3SK163-2
Q9 2SC4177
Q10 2SA1611
Q11 3SK163-2
Q12 2SC4177
Q46 2SA1611
Q13 IMX4
Q14 FMW2
TP1
TP2
TP6
TP8
TP10
SHP
SHD
Q47,48 2SA1611
Q19 FMW-10
Q20,21 2SA1611
Q22 FMW-10
D7 1SS304
LEVEL SHIFT
CLAMP
GAIN CONTROL AMP
PULSE SHAPE
SIG
CLP
Vcc
CLP CAP
GND
IC1 CXA1118AM
FL1
TRAP FILTER
Q43 2SC4177

※1: TENTATIVE ADDITIONAL PARTS IN SUFFIX-11.

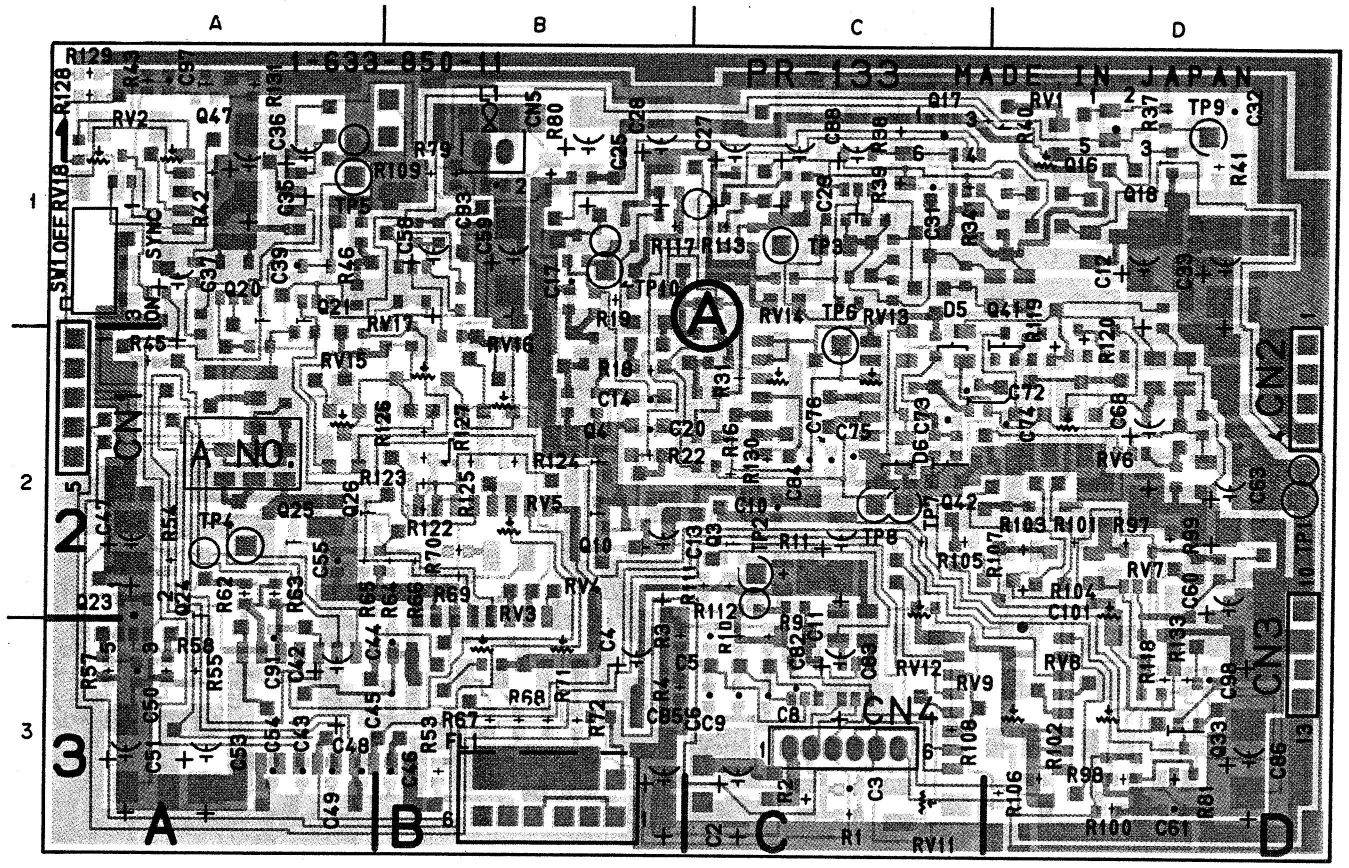
※4: MARKED(E)ARE FOR XC-77RR.(C)ARE XC-77RR-CE.
※5: ONLY SUFFIX-11.
※6 : TENTATIVE ADDTIONAL PARTS IN SUFFIX-12.


Q46 2SA1611
Q13 IMX4
Q14 FMW2
Q49 3SK163-2
Q15 2SA1226
Q45 2SA1226
Q16 FMW-10
Q18 2SC4177
Q17 IMZ1
TP3
TP9
TP4
TP5
R115 2400(E) 2700(C)
FL1
TRAP FILTER
+2.5dB
-4.5dB
CLAMP
GAMMA
BLANKING CLEAN AND SYNC MIX
WHITE CLIP
PULSE SHAPE
BLANKING CLEAN
IC2 CXA1119M
Vcc 1
Vcc 2
SIG
SIG2
SIG1
COMP
POSI
NEGA
CLP
CLP(-)
CLP(+)
γ ADJ
WHITE CLIP ADJ
BLKG
GND
+5V(A)
Q25 2SA1611
Q23 FMW-5
Q26 2SC4081
Q24 2SA1611
Q27 FMW-10
Q28,30 2SA1226
Q29,31 2SC2757
Q32
-7V
VIDEO OUT 2
GND(VIDEO) 1
CN5
SW1 SYNC
OFF
ON
CN1
SYNC IN 2
BLK IN 3
NC 4
NC 5
Q43 2SC4177
IC4 MC74HC4052F
VDD
X0 X1 X2 X3
XC
Y0 Y1 Y2 Y3
YC
OPEN
A
B
EN GND VEE
IC5 MC74HC4053F
Y0 Y1
OPEN AY
Z0 Z1
ZC
OPEN AZ
X0 X1
OPEN AX
L1 1.5μH

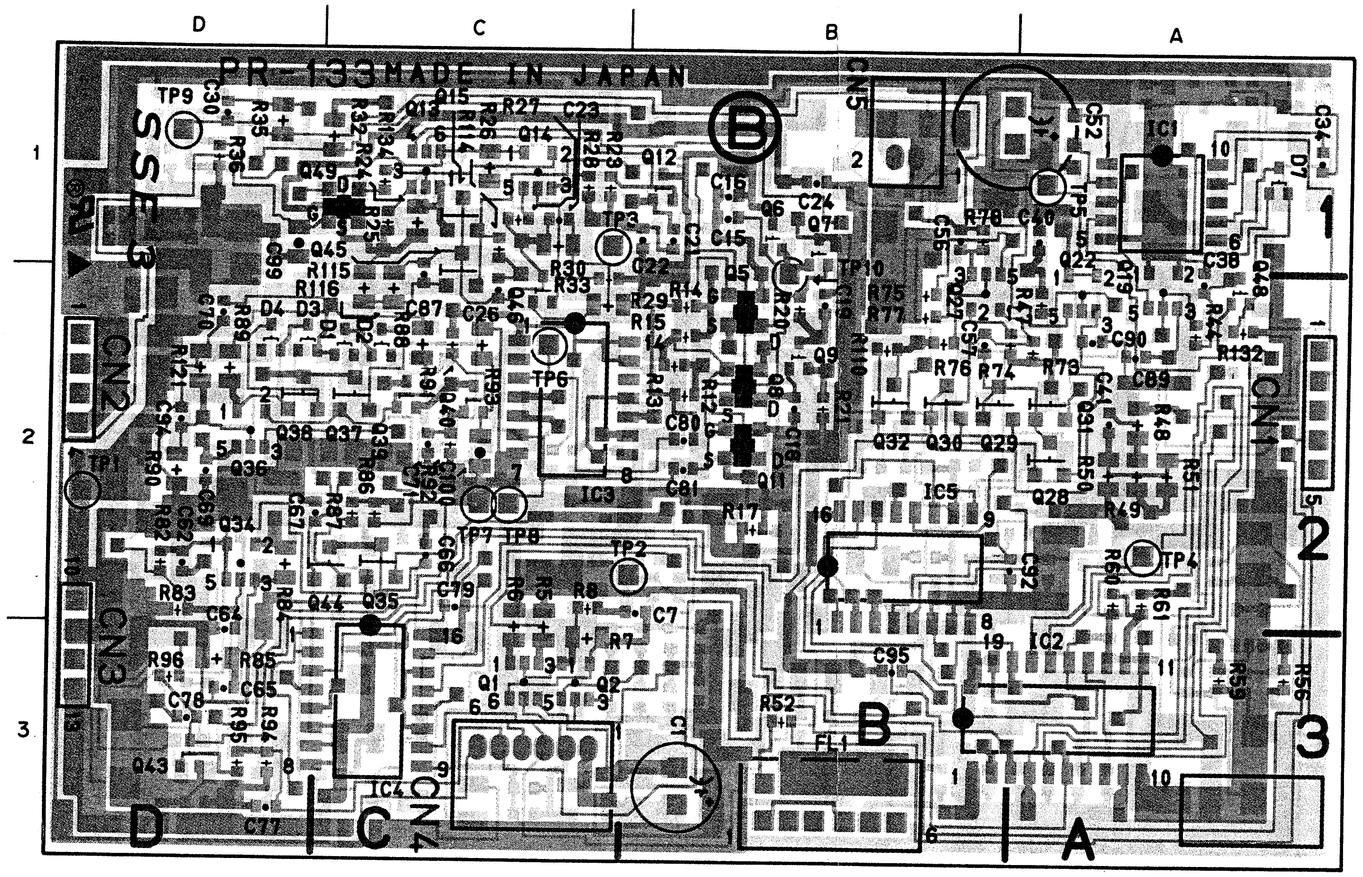
PR-133

1-633-850-11,12,13,14
XC-77RR(UCJ)
XC-77RR-CE(EK)

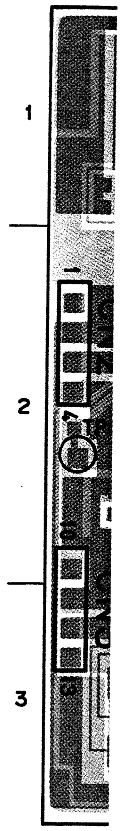
Mounting Diagram



PR-133 -A SIDE-
1-633-850-11



PR-133 -B SIDE-
1-633-850-11



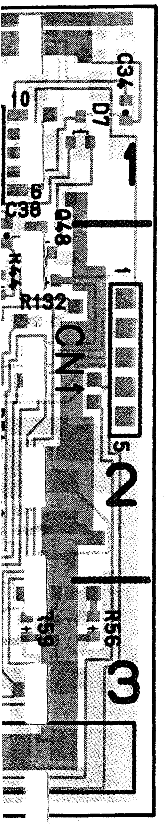
PR-133 Board Location (1-633-850-11)

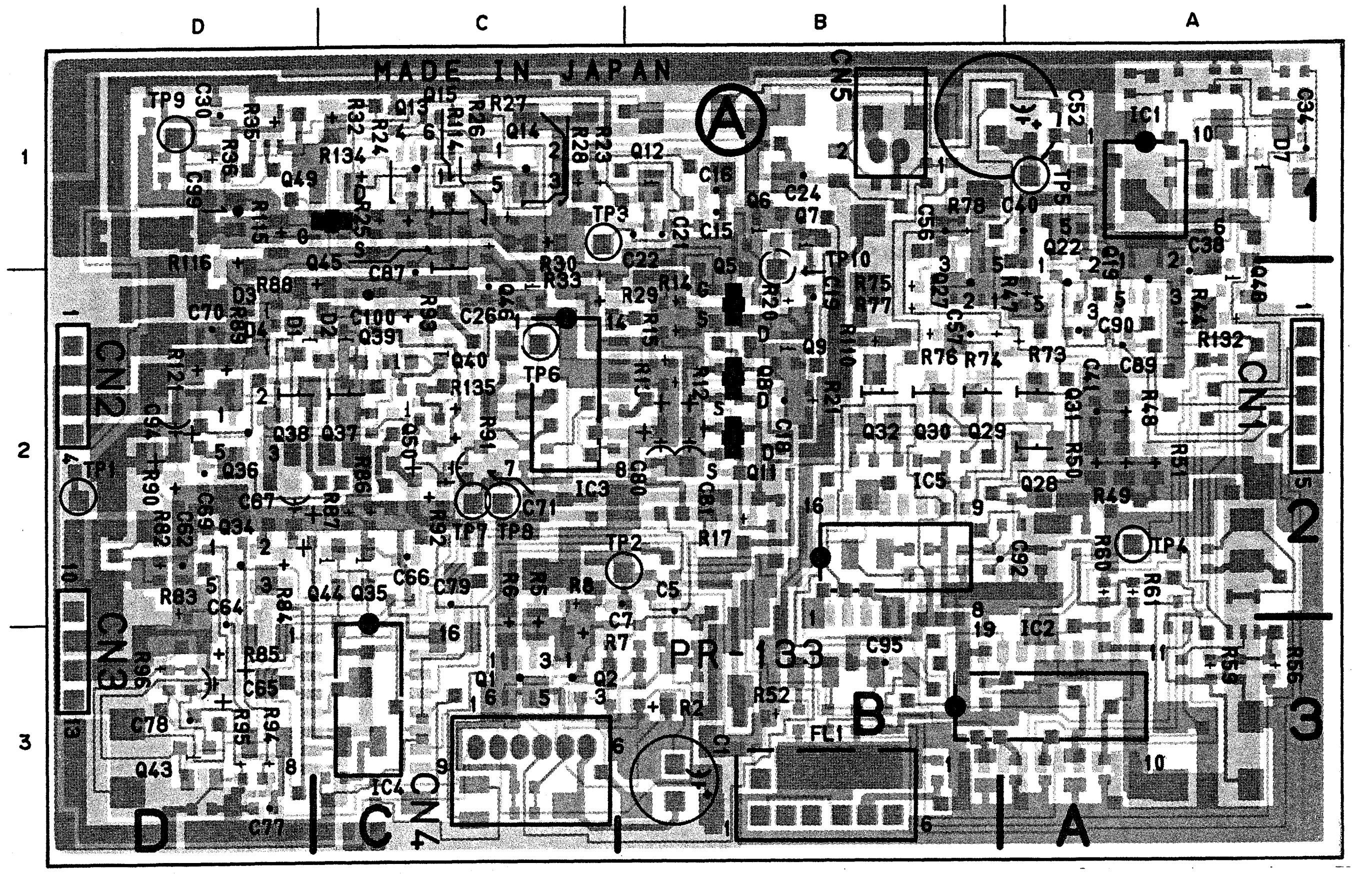
*C1	B-3
C2	C-3
C3	C-3
C4	B-3
C5	C-3
C6	C-3
*C7	B-2
C8	C-3
C9	C-3
C10	C-2
C11	C-3
C12	D-1
C13	B-2
C14	B-2
*C15	B-1
*C16	B-1
C17	B-1
*C18	B-2
*C19	B-2
C20	B-2
*C21	B-1
*C22	B-1
*C23	C-1
*C24	B-1
C25	B-1
*C26	C-2
C27	C-1
C28	B-1
C29	C-1
*C30	D-1
C31	C-1
C32	D-1
C33	D-1
*C34	A-1
C35	A-1
C36	A-1
C37	A-1
*C38	A-2
C39	A-1
*C40	A-1
*C41	A-2
C42	A-3
C43	A-3
C44	B-3
C45	B-3
C46	B-3
C47	A-2
C48	A-3
C49	A-3
C50	A-3
C51	A-3
*C52	A-1
C53	A-3
C54	A-3
C55	A-2
*C56	B-1
*C57	B-2
C58	B-1
C59	B-1
C60	D-2
C61	D-3
*C62	D-2
C63	D-2
*C64	D-3
*C65	D-3
*C66	C-2
*C67	D-2
C68	D-2
*C69	D-2
*C70	D-2
*C71	C-2
C72	C-2
C73	C-2
C74	D-2
C75	C-2
C76	C-2
*C77	D-3
*C78	D-3
*C79	C-2
*C80	B-2
*C81	B-2
C82	C-3
C83	C-3
C84	C-2
C85	B-3
C86	D-3
C87	C-2
C88	C-1
*C89	A-2
*C90	A-2
C91	A-3
*C92	A-2
C93	B-1
*C94	D-2
*C95	B-3
C97	A-1
C98	D-3
*C99	D-1
*C100	C-2
C101	D-3
*CN1	A-2
*CN2	D-2
*CN3	D-3
*CN4	C-3
*CN5	B-1
*D1	D-2
*D2	C-2
*D3	D-2
*D4	D-2
D5	C-2
D6	C-2
*D7	A-1
*FL1	B-3
*IC1	A-1
*IC2	A-3
*IC3	C-2
*IC4	C-3
*IC5	B-2
L1	B-1
*Q1	C-3
*Q2	C-3
Q3	C-2
Q4	B-2
*Q5	B-2
*Q6	B-1
*Q7	B-1
*Q8	B-2
*Q9	B-2
Q10	B-2
*Q11	B-2
*Q12	B-1
*Q13	C-1
*Q14	C-1
*Q15	C-1
Q16	D-1
Q17	C-1
Q18	D-1
*Q19	A-1
Q20	A-1
Q21	A-1
*Q22	A-1
Q23	A-2
Q24	A-2
Q25	A-2
Q26	A-2
*Q27	B-2
*Q28	A-2
*Q29	B-2
*Q30	B-2
*Q31	A-2
*Q32	B-2
Q33	D-3
*Q34	D-2
*Q35	C-2
*Q36	D-2
*Q37	C-2
*Q38	D-2
*Q39	C-2
*Q40	C-2
Q41	D-2
Q42	C-2
*Q43	D-3
*Q44	C-2
*Q45	D-1
*Q46	C-2
Q47	A-1
*Q48	A-2
*Q49	C-1
R1	C-3
R2	C-3
R3	B-3
R4	B-3
*R5	C-2
*R6	C-2
*R7	C-3
*R8	C-2
R9	C-3
R10	C-3
R11	C-2
*R12	B-2
*R13	B-2
*R14	B-2
*R15	B-2
R16	C-2
*R17	B-2
R18	B-1
R19	B-1
*R20	B-2
*R21	B-2
R22	B-2
*R23	C-1
*R24	C-1
*R25	C-1
*R26	C-1
*R27	C-1
*R28	C-1
*R29	B-2
*R30	C-1
R31	C-2
*R32	C-1
*R33	C-2
R34	C-1
*R35	D-1
*R36	D-1
R37	D-1
R38	C-1
R39	C-1
R40	D-1
R41	D-1
R42	A-1
R43	A-1
*R44	A-2
R45	A-2
R46	A-1
*R47	A-2
*R48	A-2
*R49	A-2
*R50	A-2
*R51	A-2
*R52	B-3
R53	B-3
R54	A-2
R55	A-3
*R56	A-3
R57	A-3
R58	A-3
*R59	A-3
*R60	A-2
*R61	A-2
R62	A-2
R63	A-2
R64	B-2
R65	A-2
R66	B-2
R67	B-3
R68	B-3
R69	B-2
R70	B-2
R71	B-3
R72	B-3
*R73	A-2
*R74	B-2
*R75	B-2
*R76	B-2
*R77	B-2
*R78	B-1
R79	B-1
R80	B-1
R81	D-3
*R82	D-2
*R83	D-2
*R84	D-2
*R85	D-3
*R86	C-2
*R87	C-2
*R88	C-2
*R89	D-2
*R90	D-2
*R91	C-2
*R92	C-2
*R93	C-2
*R94	D-3
*R95	D-3
*R96	D-3
R97	D-2
R98	D-3
R99	D-2
R100	D-3
R101	D-2
R102	D-3
R103	D-2
R104	D-2
R105	C-2
*R106	D-3
R107	C-2
R108	C-3
R109	B-1
*R110	B-2
R111	C-2
R113	C-1
*R114	C-1
*R115	C-2
*R116	C-2
R117	B-1
R118	D-3
R119	D-2
R120	D-2
*R121	D-2
R122	B-2
R123	B-2
R124	B-2
R125	B-2
R126	B-2
R127	B-2
R128	A-1
R129	A-1
R130	C-2
R131	A-1
*R132	A-2
R133	D-3
*R134	C-1
RV1	D-1
RV2	A-1
RV3	B-3
RV4	B-3
RV5	B-2
RV6	D-2
RV7	D-2
RV8	D-3
RV9	D-3
RV11	C-3
RV12	C-3
RV13	C-2
RV14	C-2
RV15	A-2
RV16	B-2
RV17	B-2
RV18	A-1
SW1	A-1
TP1	D-2
TP2	C-2
TP3	C-1
TP4	A-2
TP5	A-1
TP6	C-2
TP7	C-2
TP8	C-2
TP9	D-1
TP10	B-1

*: B SIDE

PR-13

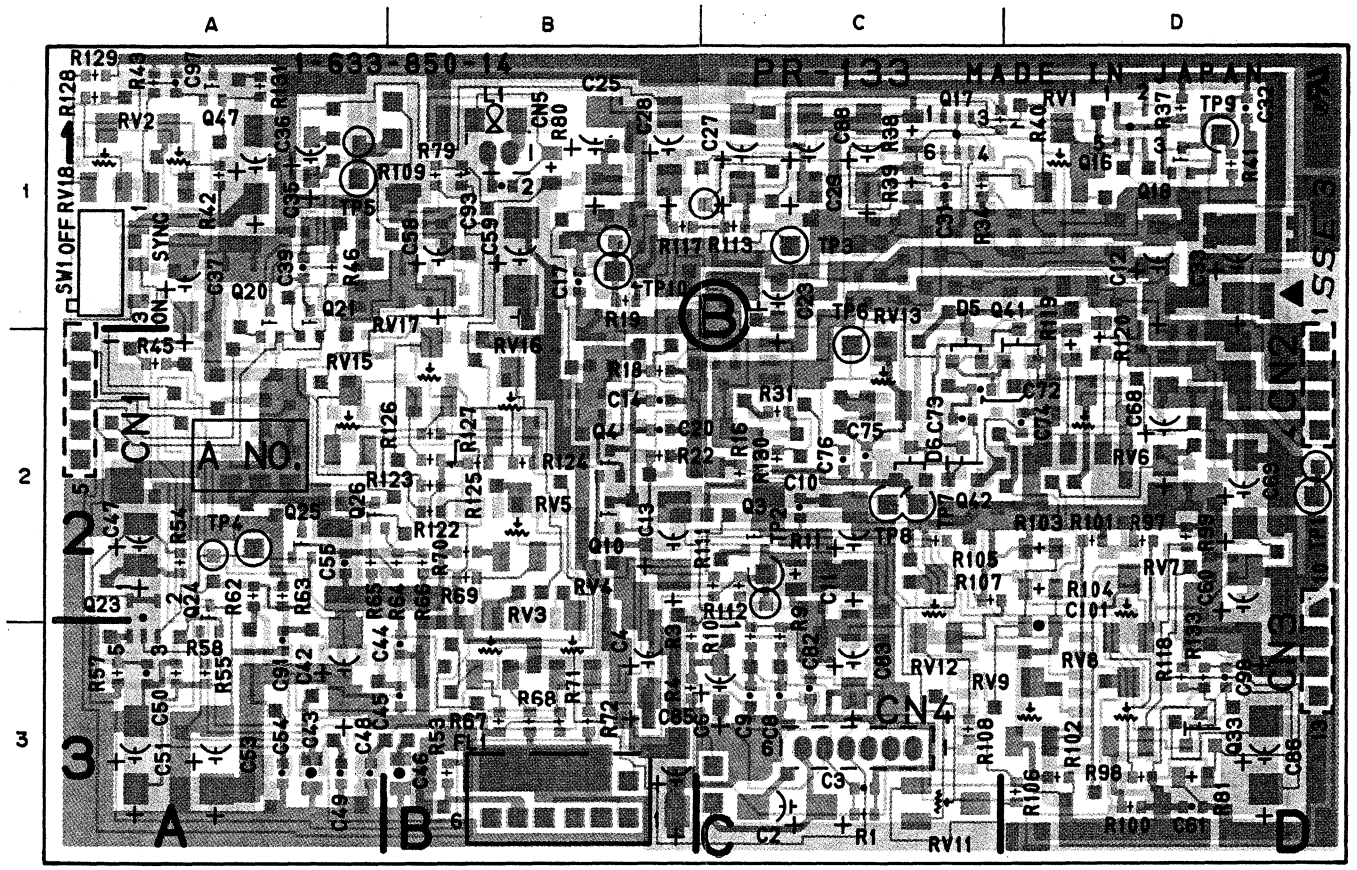
*C1	B-
C2	C-
C3	C-
C4	B-
C6	C-
*C7	B-
C8	C-
C9	C-
C10	C-
C11	C-
C12	D-
C13	B-
C14	B-
*C15	B-
*C16	B-
C17	B-
*C18	B-
*C19	B-
C20	B-
*C21	B-
*C22	B-
C23	C-
*C24	B-




D
C
B
A
1
2
3
MADE IN JAPAN
PR-133
CN1
CN2
CN3
CN4
CN5
IC1
IC2
IC3
IC4
IC5
FL1
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
Ⓐ
D
C
B
A

PR-133 -A SIDE-

1-633-850-12


A
B
C
D
1
2
3
1-633-850-14
PR-133 MADE IN JAPAN
SW1 OFF
RV18
SYNC
ON
A NO.
CN1
CN2
CN3
CN4
CN5
Ⓑ
RV1
RV2
RV3
RV5
RV6
RV7
RV8
RV9
RV11
RV12
RV13
RV15
RV16
RV17
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
TP9
TP10
FL1
A
B
C
D

PR-133 -B SIDE-

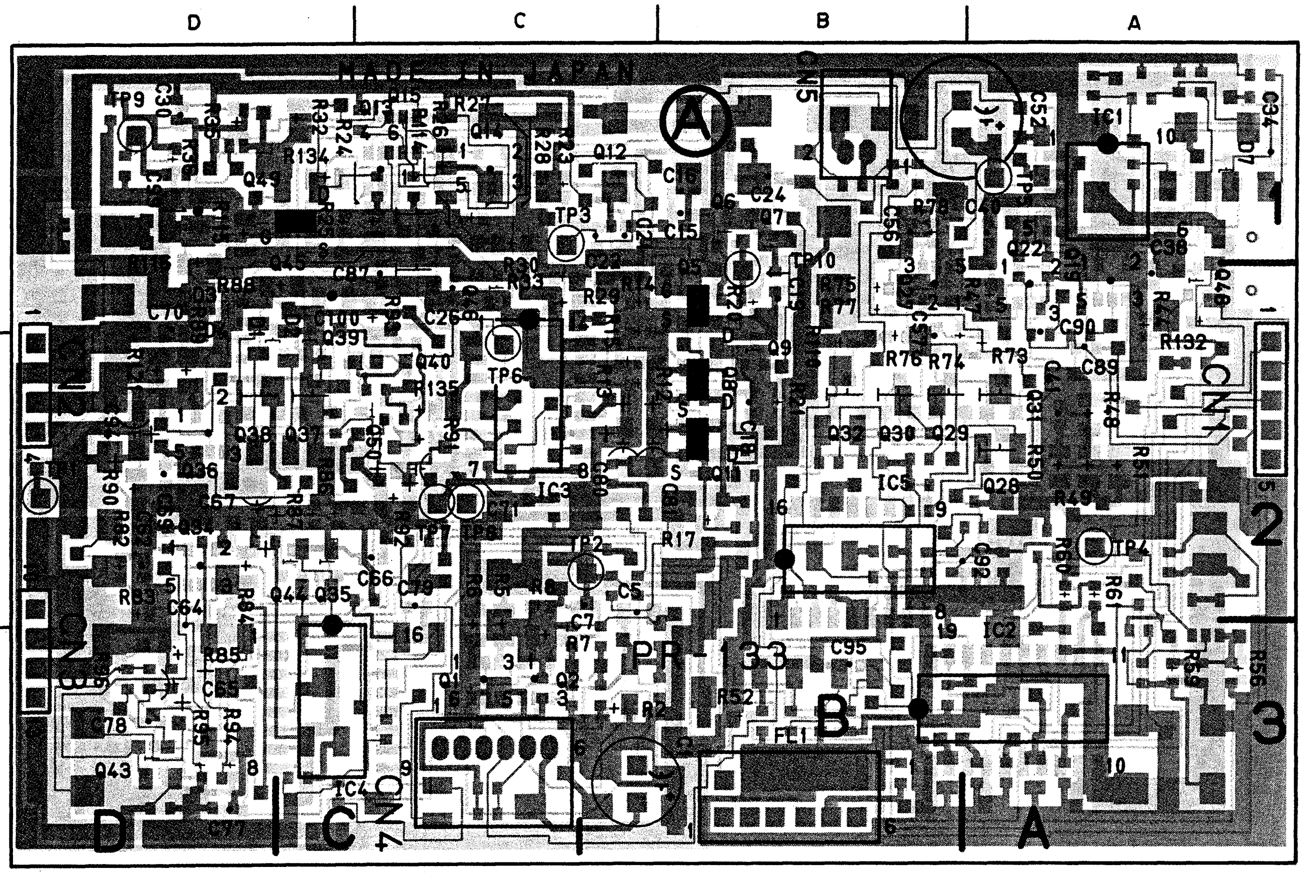
1-633-850-12

PR-133 Board Location (1-633-850-12)

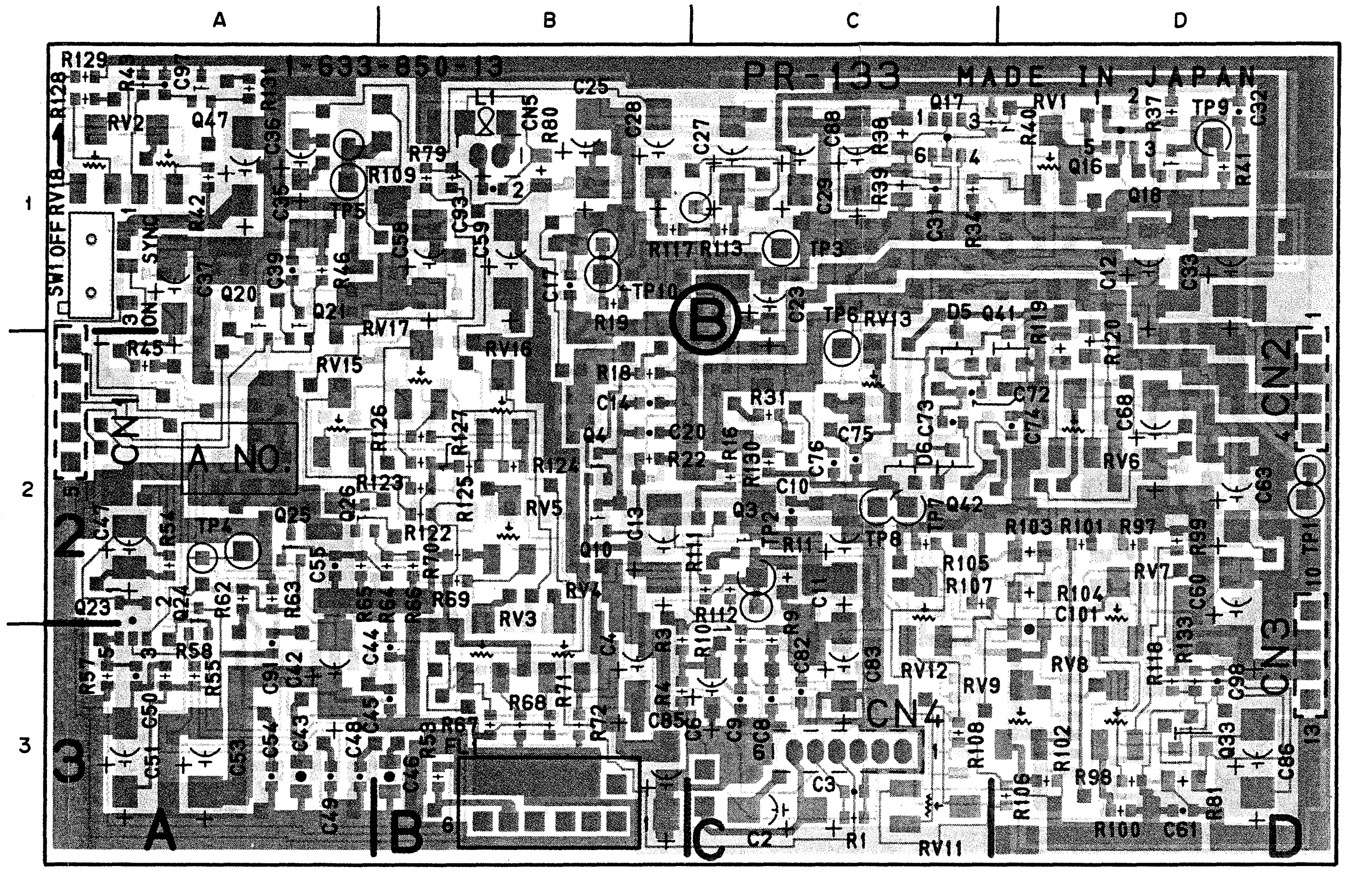
*C1	B-3
C2	C-3
C3	C-3
C4	B-3
C6	C-3
*C7	B-2
C8	C-3
C9	C-3
C10	C-2
C11	C-3
C12	D-1
C13	B-2
C14	B-2
*C15	B-1
*C16	B-1
C17	B-1
*C18	B-2
*C19	B-2
C20	B-2
*C21	B-1
*C22	B-1
C23	C-1
*C24	B-1
C25	B-1
*C26	C-2
C27	C-1
C28	B-1
C29	C-1
*C30	D-1
C31	C-1
C32	D-1
C33	D-1
*C34	A-1
C35	A-1
C36	A-1
C37	A-1
*C38	A-2
C39	A-1
*C40	A-1
*C41	A-2
C42	A-3
C43	A-3
C44	B-3
C45	B-3
C46	B-3
C47	A-2
C48	A-3
C49	A-3
C50	A-3
C51	A-3
*C52	A-1
C53	A-3
C54	A-3
C55	A-2
*C56	B-1
*C57	B-2
C58	B-1
C59	B-1
C60	D-2
C61	D-3
*C62	D-2
C63	D-2
*C64	D-3
*C65	D-3
*C66	C-2
*C67	D-2
C68	D-2
*C69	D-2
*C70	D-2
*C71	C-2
C72	C-2
C73	C-2
C74	D-2
C75	C-2
C76	C-2
*C77	D-3
*C78	D-3
*C79	C-2
*C80	B-2
*C81	B-2
C82	C-3
C83	C-3
C85	B-3
C86	D-3
C87	C-2
C88	C-1
*C89	A-2
*C90	A-2
C91	A-3
*C92	A-2
C93	B-1
*C94	D-2
*C95	B-3
C97	A-1
C98	D-3
*C99	D-1
*C100	C-2
C101	D-3
*CN1	A-2
*CN2	D-2
*CN3	D-3
*CN4	C-3
*CN5	B-1
*D1	D-2
*D2	C-2
*D3	D-2
*D4	D-2
D5	C-2
D6	C-2
*D7	A-1
*FL1	B-3
*IC1	A-1
*IC2	A-3
*IC3	C-2
*IC4	C-3
*IC5	B-2
L1	B-1
*Q1	C-3
*Q2	C-3
Q3	C-2
Q4	B-2
*Q5	B-2
*Q6	B-1
*Q7	B-1
*Q8	B-2
*Q9	B-2
Q10	B-2
*Q11	B-2
*Q12	B-1
*Q13	C-1
*Q14	C-1
*Q15	C-1
Q16	D-1
Q17	C-1
Q18	D-1
*Q19	A-1
Q20	A-1
Q21	A-1
*Q22	A-1
Q23	A-2
Q24	A-2
Q25	A-2
Q26	A-2
*Q27	B-2
*Q28	A-2
*Q29	B-2
*Q30	B-2
*Q31	A-2
*Q32	B-2
Q33	D-3
*Q34	D-2
*Q35	C-2
Q36	D-2
*Q37	C-2
*Q38	D-2
*Q39	C-2
*Q40	C-2
Q41	D-2
Q42	C-2
*Q43	D-3
*Q44	C-2
*Q45	D-1
*Q46	C-2
Q47	A-1
*Q48	A-2
*Q49	C-1
Q50	C-2
R1	C-3
*R2	B-3
R3	B-3
R4	B-3
*R5	C-2
*R6	C-2
*R7	C-3
*R8	C-2
R9	C-3
R10	C-3
R11	C-2
*R12	B-2
*R13	B-2
*R14	B-2
*R15	B-2
R16	C-2
*R17	B-2
R18	B-1
R19	B-1
*R20	B-2
*R21	B-2
R22	B-2
*R23	C-1
*R24	C-1
*R25	C-1
*R26	C-1
*R27	C-1
*R28	C-1
*R29	B-2
*R30	C-1
R31	C-2
*R32	C-1
*R33	C-2
R34	C-1
*R35	D-1
*R36	D-1
R37	D-1
R38	C-1
R39	C-1
R40	D-1
R41	D-1
R42	A-1
R43	A-1
*R44	A-2
R45	A-2
R46	A-1
*R47	A-2
*R48	A-2
*R49	A-2
*R50	A-2
*R51	A-2
*R52	B-3
R53	B-3
R54	A-2
R55	A-3
*R56	A-3
R57	A-3
R58	A-3
*R59	A-3
*R60	A-2
*R61	A-2
R62	A-2
R63	A-2
R64	B-2
R65	A-2
R66	B-2
R67	B-3
R68	B-3
R69	B-2
R70	B-2
R71	B-3
R72	B-3
*R73	A-2
*R74	B-2
*R75	B-2
*R76	B-2
*R77	B-2
*R78	B-1
R79	B-1
R80	B-1
R81	D-3
*R82	D-2
*R83	D-2
*R84	D-2
*R85	D-3
*R86	C-2
*R87	C-2
*R88	C-2
*R89	D-2
*R90	D-2
*R91	C-2
*R92	C-2
*R93	C-2
*R94	D-3
*R95	D-3
*R96	D-3
R97	D-2
R98	D-3
R99	D-2
R100	D-3
R101	D-2
R102	D-3
R103	D-2
R104	D-2
R105	C-2
*R106	D-3
R107	C-2
R108	C-3
R109	B-1
*R110	B-2
R111	C-2
R113	C-1
*R114	C-1
*R115	D-1
*R116	D-1
R117	B-1
R118	D-3
R119	D-2
R120	D-2
*R121	D-2
R122	B-2
R123	B-2
R124	B-2
R125	B-2
R126	B-2
R127	B-2
R128	A-1
R129	A-1
R130	C-2
R131	A-1
*R132	A-2
R133	D-3
*R134	C-1
*R135	C-2
RV1	D-1
RV2	A-1
RV3	B-3
RV4	B-3
RV5	B-2
RV6	D-2
RV7	D-2
RV8	D-3
RV9	D-3
RV11	C-3
RV12	C-3
RV13	C-2
RV14	C-2
RV15	A-2
RV16	B-2
RV17	B-2
RV18	A-1
SW1	A-1
TP1	D-2
TP2	C-2
TP3	C-1
TP4	A-2
TP5	A-1
TP6	C-2
TP7	C-2
TP8	C-2
TP9	D-1
TP10	B-1

*: A SIDE

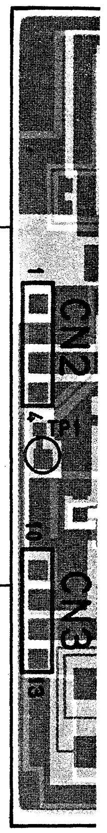
Mounting Diagram



PR-133 -A SIDE-
1-633-850-13



PR-133 -B SIDE-
1-633-850-13



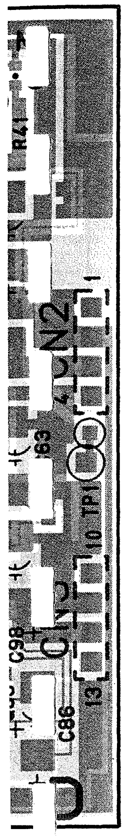
PR-133 Board Location (1-633-850-13)

*C1	B-3
C2	C-3
C3	C-3
C4	B-3
*C5	B-3
C6	C-3
*C7	B-2
C8	C-3
C9	C-3
C10	C-2
C11	C-3
C12	D-1
C13	B-2
C14	B-2
*C15	B-1
*C16	B-1
C17	B-1
*C18	B-2
*C19	B-2
C20	B-2
*C21	B-1
*C22	B-1
C23	C-1
*C24	B-1
C25	B-1
*C26	C-2
C27	C-1
C28	B-1
C29	C-1
*C30	D-1
C31	C-1
C32	D-1
C33	D-1
*C34	A-1
C35	A-1
C36	A-1
C37	A-1
*C38	A-2
C39	A-1
*C40	A-1
*C41	A-2
C42	A-3
C43	A-3
C44	B-3
C45	B-3
C46	B-3
C47	A-2
C48	A-3
C49	A-3
C50	A-3
C51	A-3
*C52	A-1
C53	A-3
C54	A-3
C55	A-2
*C56	B-1
*C57	B-2
C58	B-1
C59	B-1
C60	D-2
C61	D-3
*C62	D-2
C63	D-2
*C64	D-3
*C65	D-3
*C66	C-2
*C67	D-2
C68	D-2
*C69	D-2
*C70	D-2
*C71	C-2
C72	C-2
C73	C-2
C74	D-2
C75	C-2
C76	C-2
*C77	D-3
*C78	D-3
*C79	C-2
*C80	B-2
*C81	B-2
C82	C-3
C83	C-3
C85	B-3
C86	D-3
C87	C-2
C88	C-1
*C89	A-2
*C90	A-2
C91	A-3
*C92	A-2
C93	B-1
*C94	D-2
*C95	B-3
C97	A-1
C98	D-3
*C99	D-1
*C100	C-2
C101	D-3
*CN1	A-2
*CN2	D-2
*CN3	D-3
*CN4	C-3
*CN5	B-1
*D1	D-2
*D2	C-2
*D3	D-2
*D4	D-2
D5	C-2
D6	C-2
*D7	A-1
*FL1	B-3
*IC1	A-1
*IC2	A-3
*IC3	C-2
*IC4	C-3
*IC5	B-2
L1	B-1
*Q1	C-3
*Q2	C-3
Q3	C-2
Q4	B-2
*Q5	B-2
*Q6	B-1
*Q7	B-1
*Q8	B-2
*Q9	B-2
Q10	B-2
*Q11	B-2
*Q12	B-1
*Q13	C-1
*Q14	C-1
*Q15	C-1
Q16	D-1
Q17	C-1
Q18	D-1
*Q19	A-1
Q20	A-1
Q21	A-1
*Q22	A-1
Q23	A-2
Q24	A-2
Q25	A-2
Q26	A-2
*Q27	B-2
*Q28	A-2
*Q29	B-2
*Q30	B-2
*Q31	A-2
*Q32	B-2
Q33	D-3
*Q34	D-2
*Q35	C-2
Q36	D-2
*Q37	C-2
*Q38	D-2
*Q39	C-2
*Q40	C-2
Q41	D-2
Q42	C-2
*Q43	D-3
*Q44	C-2
*Q45	D-1
*Q46	C-2
Q47	A-1
*Q48	A-2
*Q49	C-1
Q50	C-2
R1	C-3
*R2	B-3
R3	B-3
R4	B-3
*R5	C-2
*R6	C-2
*R7	C-3
*R8	C-2
R9	C-3
R10	C-3
R11	C-2
*R12	B-2
*R13	B-2
*R14	B-2
*R15	B-2
R16	C-2
*R17	B-2
R18	B-1
R19	B-1
*R20	B-2
*R21	B-2
R22	B-2
*R23	C-1
*R24	C-1
*R25	C-1
*R26	C-1
*R27	C-1
*R28	C-1
*R29	B-2
*R30	C-1
R31	C-2
*R32	C-1
*R33	C-2
R34	C-1
*R35	D-1
*R36	D-1
R37	D-1
R38	C-1
R39	C-1
R40	D-1
R41	D-1
R42	A-1
R43	A-1
*R44	A-2
R45	A-2
R46	A-1
*R47	A-2
*R48	A-2
*R49	A-2
*R50	A-2
*R51	A-2
*R52	B-3
R53	B-3
R54	A-2
R55	A-3
*R56	A-3
R57	A-3
R58	A-3
*R59	A-3
*R60	A-2
*R61	A-2
R62	A-2
R63	A-2
R64	B-2
R65	A-2
R66	B-2
R67	B-3
R68	B-3
R69	B-2
R70	B-2
R71	B-3
R72	B-3
*R73	A-2
*R74	B-2
*R75	B-2
*R76	B-2
*R77	B-2
*R78	B-1
R79	B-1
R80	B-1
R81	D-3
*R82	D-2
*R83	D-2
*R84	D-2
*R85	D-3
*R86	C-2
*R87	C-2
*R88	C-2
*R89	D-2
*R90	D-2
*R91	C-2
*R92	C-2
*R93	C-2
*R94	D-3
*R95	D-3
*R96	D-3
R97	D-2
R98	D-3
R99	D-2
R100	D-3
R101	D-2
R102	D-3
R103	D-2
R104	D-2
R105	C-2
*R106	D-3
R107	C-2
R108	C-3
R109	B-1
*R110	B-2
R111	C-2
R113	C-1
*R114	C-1
*R115	D-1
*R116	D-1
R117	B-1
R118	D-3
R119	D-2
R120	D-2
*R121	D-2
R122	B-2
R123	B-2
R124	B-2
R125	B-2
R126	B-2
R127	B-2
R128	A-1
R129	A-1
R130	C-2
R131	A-1
*R132	A-2
R133	D-3
*R134	C-1
*R135	C-2
RV1	D-1
RV2	A-1
RV3	B-3
RV4	B-3
RV5	B-2
RV6	D-2
RV7	D-2
RV8	D-3
RV9	D-3
RV11	C-3
RV12	C-3
RV13	C-2
RV14	C-2
RV15	A-2
RV16	B-2
RV17	B-2
RV18	A-1
SW1	A-1
TP1	D-2
TP2	C-2
TP3	C-1
TP4	A-2
TP5	A-1
TP6	C-2
TP7	C-2
TP8	C-2
TP9	D-1
TP10	B-1

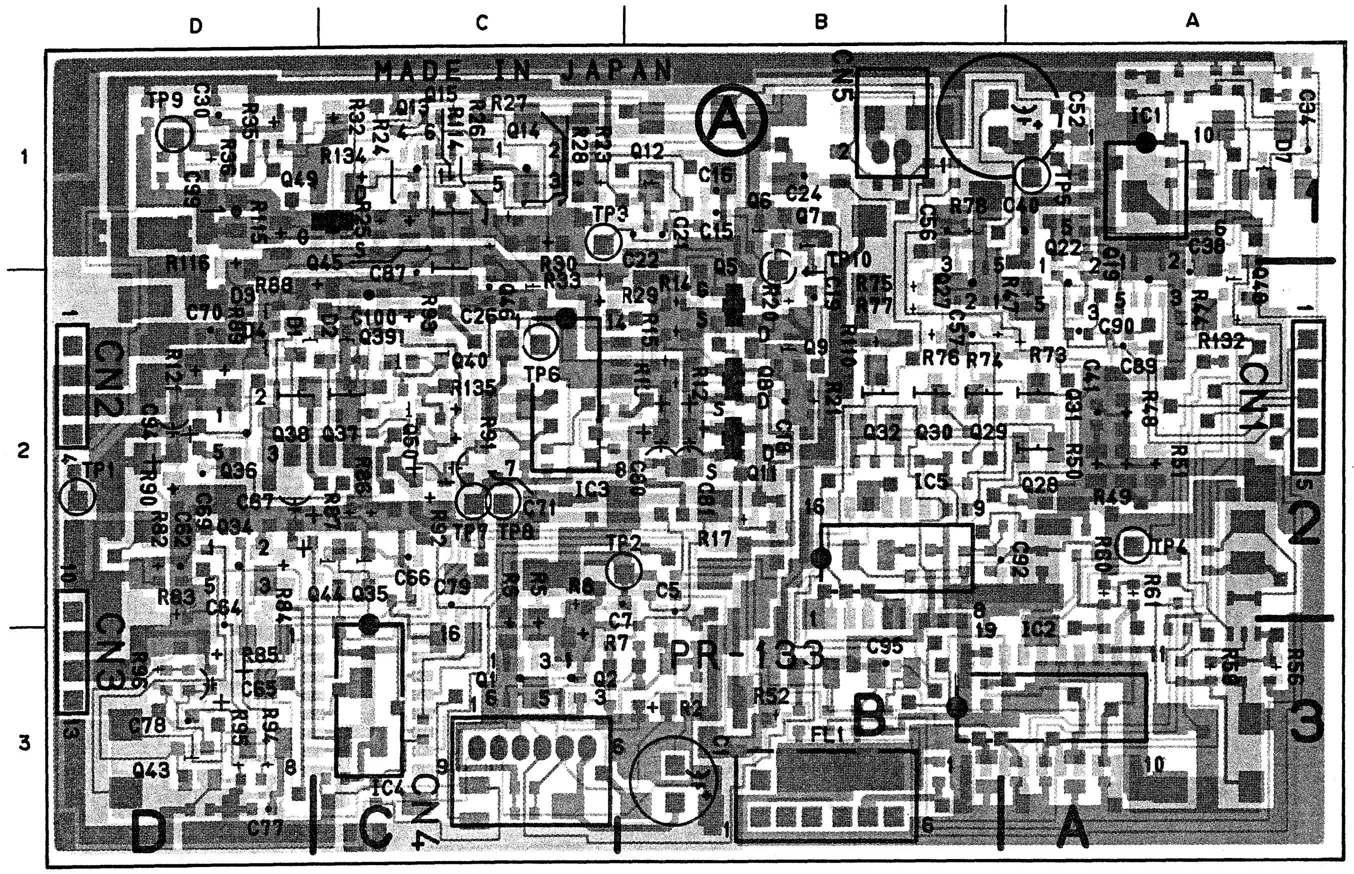
*: A SIDE

PR-13

*C1	B-
C2	C-
C3	C-
C4	B-
*C5	B-
C6	C-
*C7	B-
C8	C-
C9	C-
C10	C-
C11	C-
C12	D-1
C13	B-
C14	B-
*C15	B-1
*C16	B-1
C17	B-1
*C18	B-
*C19	B-
C20	B-
*C21	B-1
*C22	B-1
C23	C-1

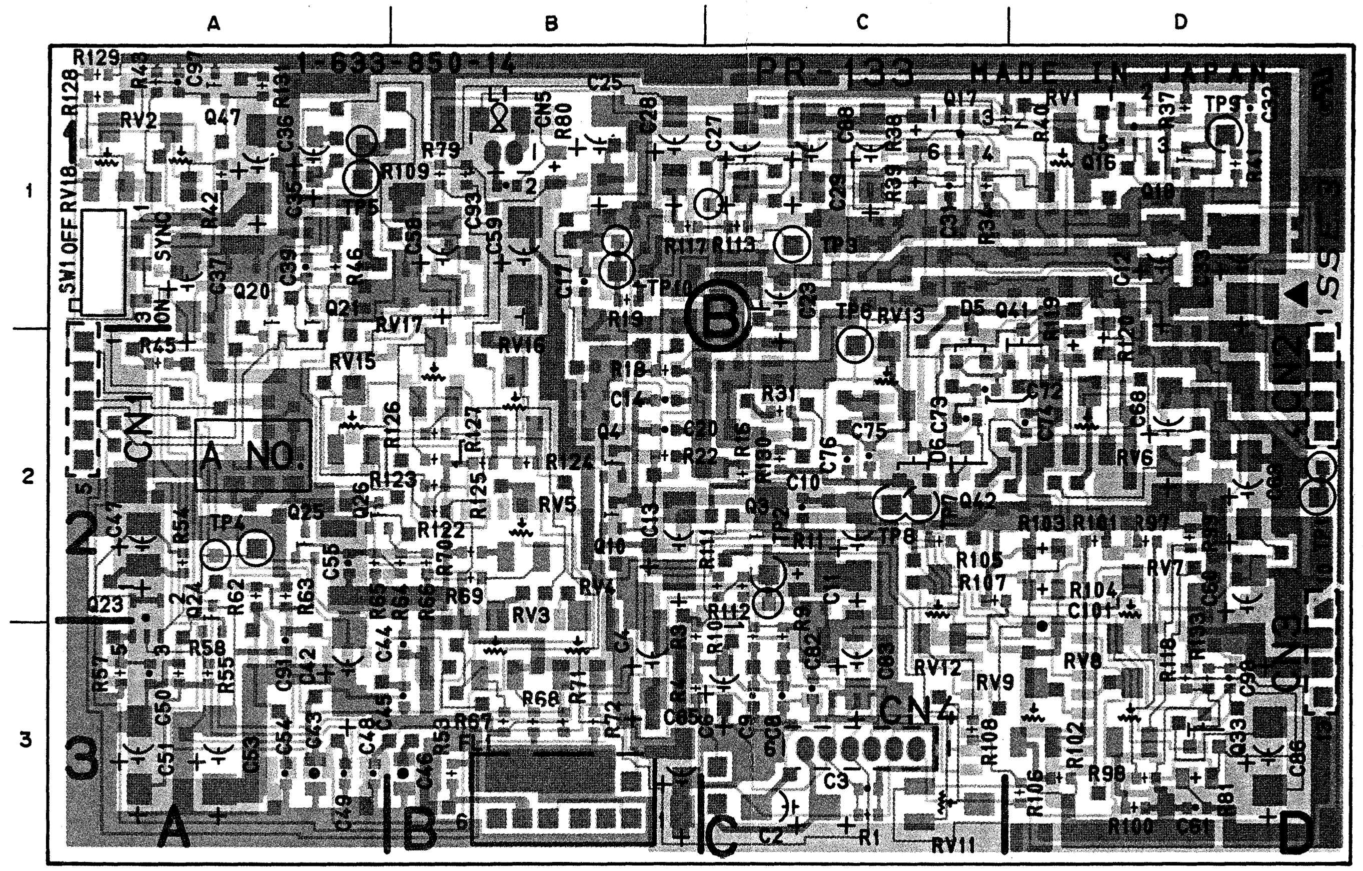


-B SIDE-



PR-133 -A SIDE-

1-633-850-14



PR-133 -B SIDE-

1-633-850-14

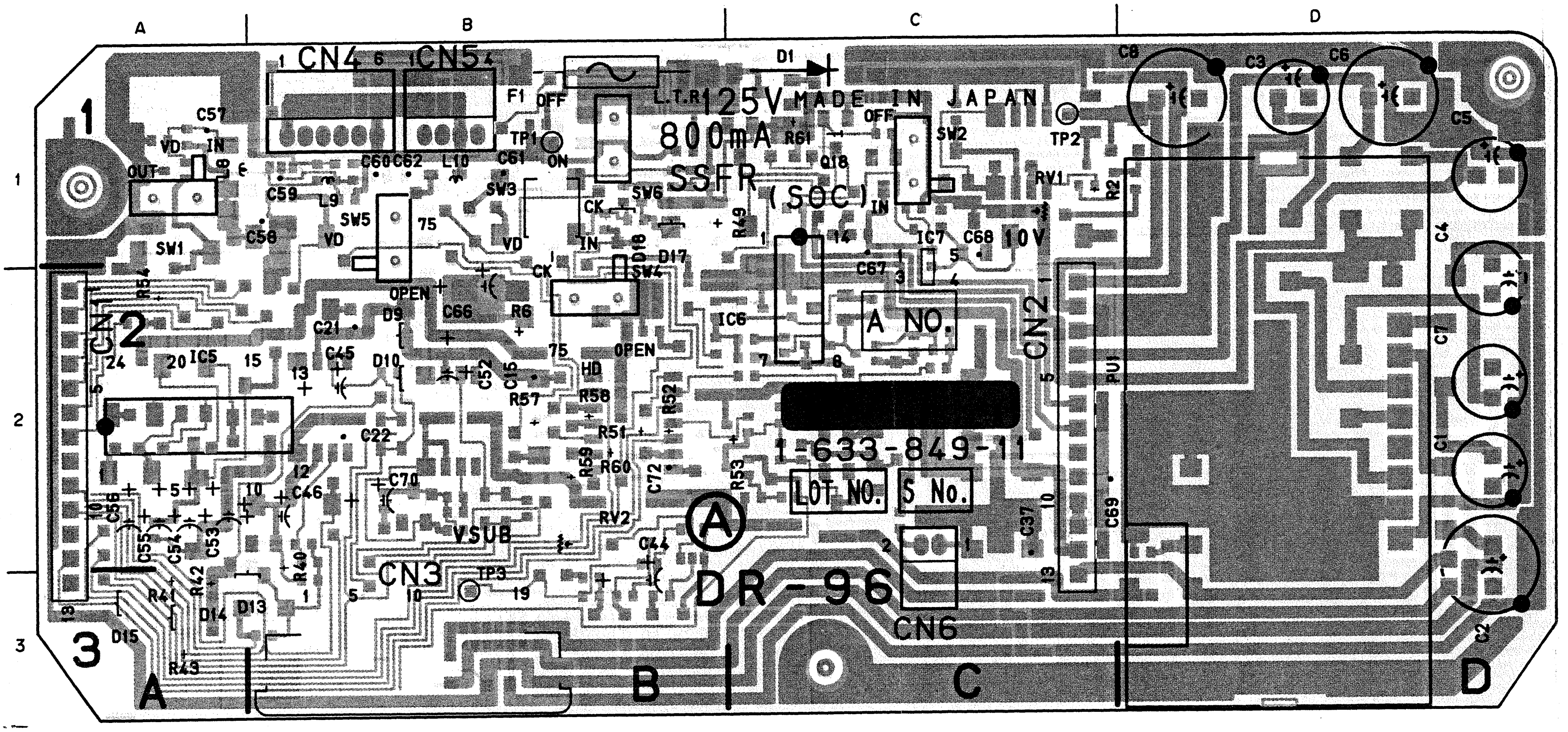
PR-133 Board Location (1-633-850-14)

*C1	B-3
C2	C-3
C3	C-3
C4	B-3
*C5	B-3
C6	C-3
*C7	B-2
C8	C-3
C9	C-3
C10	C-2
C11	C-3
C12	D-1
C13	B-2
C14	B-2
*C15	B-1
*C16	B-1
C17	B-1
*C18	B-2
*C19	B-2
C20	B-2
*C21	B-1
*C22	B-1
C23	C-1
*C24	B-1
C25	B-1
*C26	C-2
C27	C-1
C28	B-1
C29	C-1
*C30	D-1
C31	C-1
C32	D-1
C33	D-1
*C34	A-1
C35	A-1
C36	A-1
C37	A-1
*C38	A-2
C39	A-1
*C40	A-1
*C41	A-2
C42	A-3
C43	A-3
C44	B-3
C45	B-3
C46	B-3
C47	A-2
C48	A-3
C49	A-3
C50	A-3
C51	A-3
*C52	A-1
C53	A-3
C54	A-3
C55	A-2
*C56	B-1
*C57	B-2
C58	B-1
C59	B-1
C60	D-2
C61	D-3
*C62	D-2
C63	D-2
*C64	D-3
*C65	D-3
*C66	C-2
*C67	D-2
C68	D-2
*C69	D-2
*C70	D-2
*C71	C-2
C72	C-2
C73	C-2
C74	D-2
C75	C-2
C76	C-2
*C77	D-3
*C78	D-3
*C79	C-2
*C80	B-2
*C81	B-2
C82	C-3
C83	C-3
C85	B-3
C86	D-3
*C87	C-2
C88	C-1
*C89	A-2
*C90	A-2
C91	A-3
*C92	A-2
C93	B-1
*C94	D-2
*C95	B-3
C97	A-1
C98	D-3
*C99	D-1
*C100	C-2
C101	D-3
*CN1	A-2
*CN2	D-2
*CN3	D-3
*CN4	C-3
*CN5	B-1
*D1	D-2
*D2	C-2
*D3	D-2
*D4	D-2
D5	C-2
D6	C-2
*D7	A-1
*FL1	B-3
*IC1	A-1
*IC2	A-3
*IC3	C-2
*IC4	C-3
*IC5	B-2
L1	B-1
*Q1	C-3
*Q2	C-3
Q3	C-2
Q4	B-2
*Q5	B-2
*Q6	B-1
*Q7	B-1
*Q8	B-2
*Q9	B-2
Q10	B-2
*Q11	B-2
*Q12	B-1
*Q13	C-1
*Q14	C-1
*Q15	C-1
Q16	D-1
Q17	C-1
Q18	D-1
*Q19	A-1
Q20	A-1
Q21	A-1
*Q22	A-1
Q23	A-2
Q24	A-2
Q25	A-2
Q26	A-2
*Q27	B-2
*Q28	A-2
*Q29	B-2
*Q30	B-2
*Q31	A-2
*Q32	B-2
Q33	D-3
*Q34	D-2
*Q35	C-2
Q36	D-2
*Q37	C-2
*Q38	D-2
*Q39	C-2
*Q40	C-2
Q41	D-2
Q42	C-2
*Q43	D-3
*Q44	C-2
*Q45	D-1
*Q46	C-2
Q47	A-1
*Q48	A-2
*Q49	C-1
Q50	C-2
R1	C-3
*R2	B-3
R3	B-3
R4	B-3
*R5	C-2
*R6	C-2
*R7	C-3
*R8	C-2
R9	C-3
R10	C-3
R11	C-2
*R12	B-2
*R13	B-2
*R14	B-2
*R15	B-2
R16	C-2
*R17	B-2
R18	B-1
R19	B-1
*R20	B-2
*R21	B-2
R22	B-2
*R23	C-1
*R24	C-1
*R25	C-1
*R26	C-1
*R27	C-1
*R28	C-1
*R29	B-2
*R30	C-1
R31	C-2
*R32	C-1
*R33	C-2
R34	C-1
*R35	D-1
*R36	D-1
R37	D-1
R38	C-1
R39	C-1
R40	D-1
R41	D-1
R42	A-1
R43	A-1
*R44	A-2
R45	A-2
R46	A-1
*R47	A-2
*R48	A-2
*R49	A-2
*R50	A-2
*R51	A-2
*R52	B-3
R53	B-3
R54	A-2
R55	A-3
*R56	A-3
R57	A-3
R58	A-3
*R59	A-3
*R60	A-2
*R61	A-2
R62	A-2
R63	A-2
R64	B-2
R65	A-2
R66	B-2
R67	B-3
R68	B-3
R69	B-2
R70	B-2
R71	B-3
R72	B-3
*R73	A-2
*R74	B-2
*R75	B-2
*R76	B-2
*R77	B-2
*R78	B-1
R79	B-1
R80	B-1
R81	D-3
*R82	D-2
*R83	D-2
*R84	D-2
*R85	D-3
*R86	C-2
*R87	C-2
*R88	C-2
*R89	D-2
*R90	D-2
*R91	C-2
*R92	C-2
*R93	C-2
*R94	D-3
*R95	D-3
*R96	D-3
R97	D-2
R98	D-3
R99	D-2
R100	D-3
R101	D-2
R102	D-3
R103	D-2
R104	D-2
R105	C-2
R106	D-3
R107	C-2
R108	C-3
R109	B-1
*R110	B-2
R111	C-2
R112	C-2
R113	C-1
*R114	C-1
*R115	D-1
*R116	D-1
R117	B-1
R118	D-3
R119	D-2
R120	D-2
*R121	D-2
R122	B-2
R123	B-2
R124	B-2
R125	B-2
R126	B-2
R127	B-2
R128	A-1
R129	A-1
R130	C-2
R131	A-1
*R132	A-2
R133	D-3
*R134	C-1
*R135	C-2
RV1	D-1
RV2	A-1
RV3	B-3
RV4	B-3
RV5	B-2
RV6	D-2
RV7	D-2
RV8	D-3
RV9	D-3
RV11	C-3
RV12	C-3
RV13	C-2
RV15	A-2
RV16	B-2
RV17	B-2
RV18	A-1
SW1	A-1
TP1	D-2
TP2	C-2
TP3	C-1
TP4	A-2
TP5	A-1
TP6	C-2
TP7	C-2
TP8	C-2
TP9	D-1
TP10	B-1

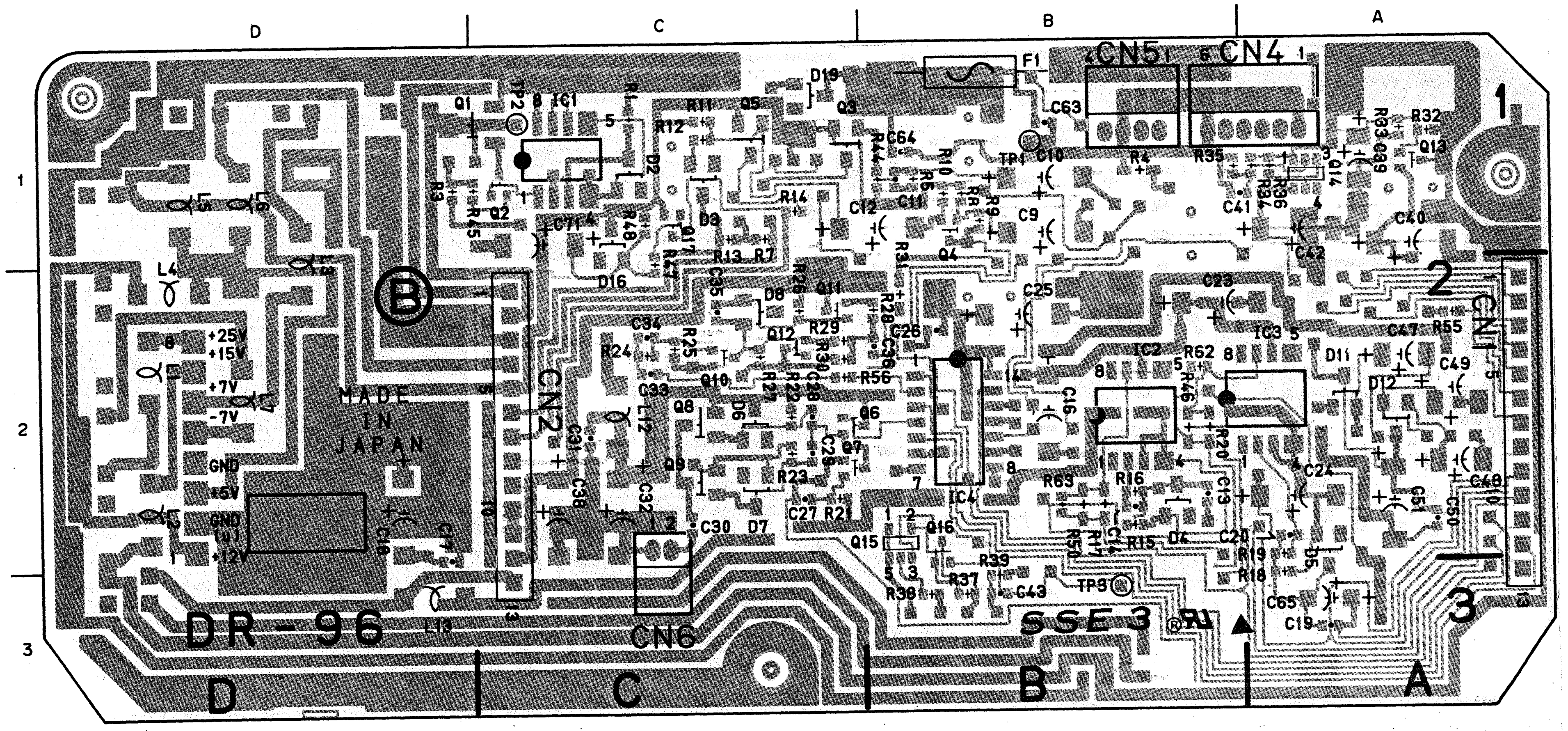
*: A SIDE

XC-77RR(UCJ)
XC-77RR-CE(EK)

A-5. DR-96 BOARD


A
B
C
D
1
2
3
CN4
CN5
CN1
CN2
CN3
CN6
F1
D1
125V
800mA
SSFR
(SOC)
MADE IN JAPAN
IC5
IC6
IC7
SW1
SW2
SW3
SW4
SW5
SW6
TP1
TP2
TP3
RV1
RV2
VSUB
A NO.
LOT NO.
S No.
1-633-849-11
Ⓐ
DR-96

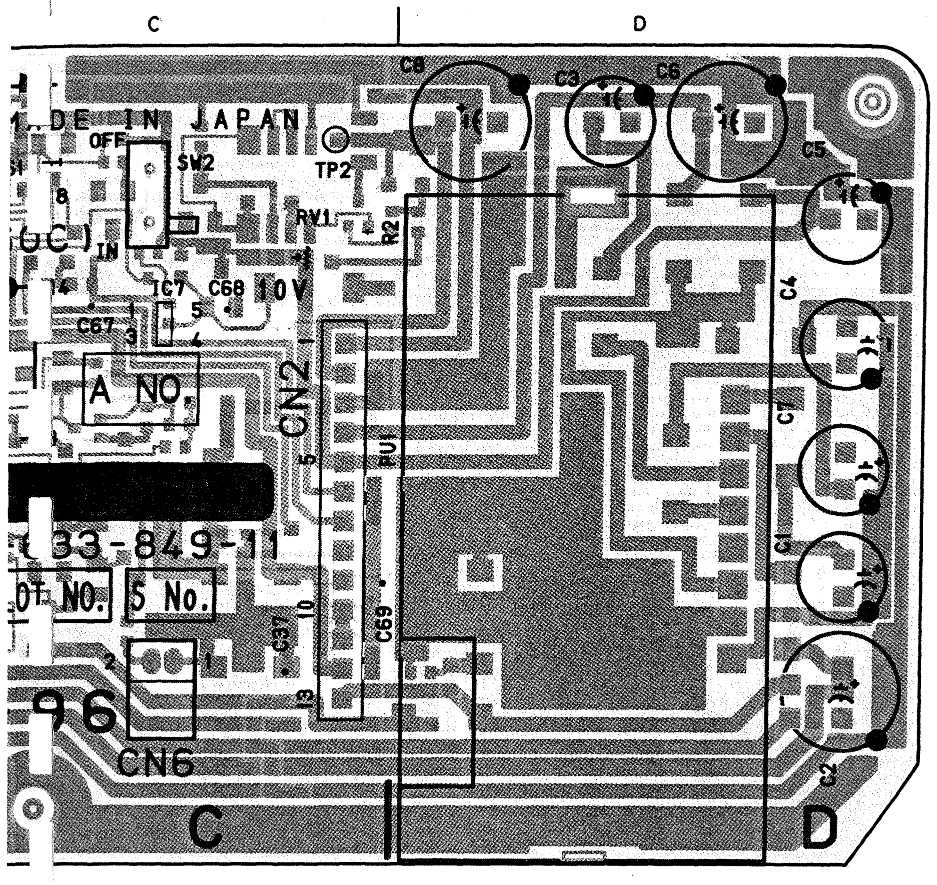
DR-96 -A SIDE-
1-633-849-11


D
C
B
A
1
2
3
CN5
CN4
CN2
CN1
CN6
F1
IC1
IC2
IC3
IC4
TP1
TP2
TP3
+25V
+15V
+7V
-7V
GND
+5V
GND (U)
+12V
MADE IN JAPAN
Ⓑ
DR-96
SSE3

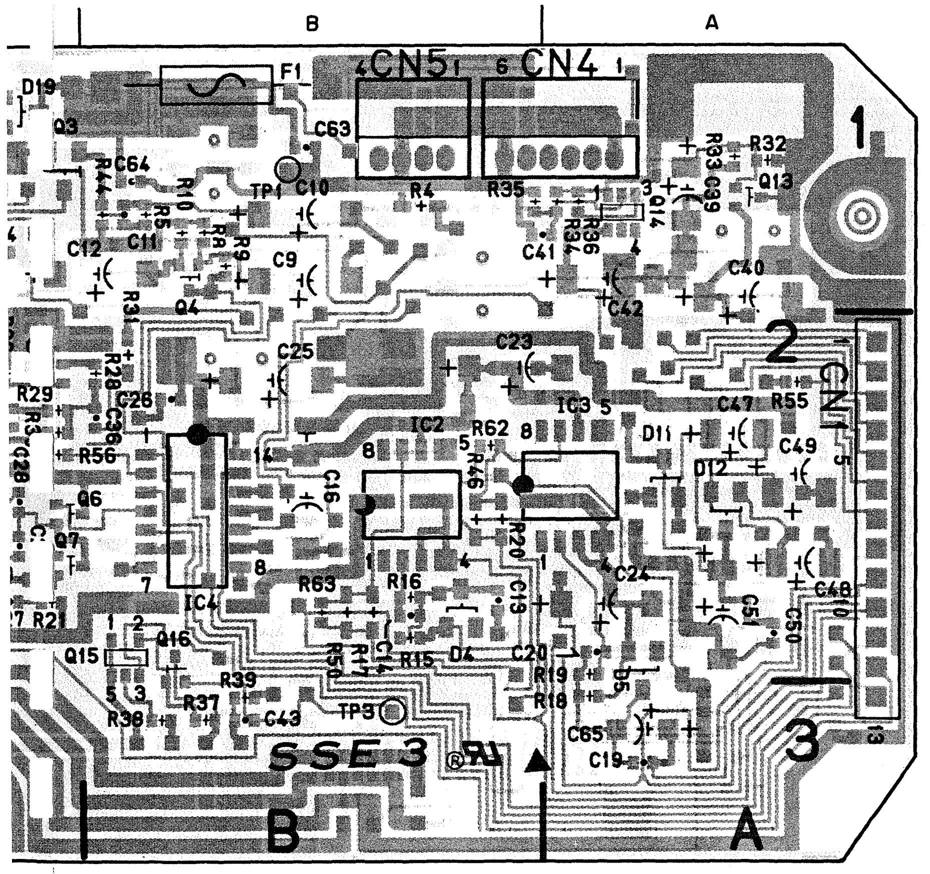
DR-96 -B SIDE-
1-633-849-11

D

C1
C2
C3
C4
C5
C6
C7
C8
*C9
*C1
*C1
*C1
*C1
*C1
C1
*C1
*C1
*C1
*C1
*C2
C2
C2
*C2
*C2
*C2
*C2
*C2
*C2
*C2
*C3
*C3
*C3
*C3
*C3
*C3
*C3
C3
*C3
*C3
*C4
*C4
*C4
*C4
C4
C4
C4
*C4
*C4
*C4
*C5
C5
C5
C5
C5
C5
C5


C
D
MADE IN JAPAN
OFF
SW2
TP2
RV1
R2
C8
C3
C6
C5
C4
C7
C1
C2
IC7
C68
10V
C67
A NO.
CN2
PU1
633-849-11
LOT NO.
S No.
C37
C69
CN6
96
C
D

DR-96 -A SIDE-
1-633-849-11


B
A
F1
CN5
CN4
D19
Q3
C63
C64
TP1
C10
R4
R35
R32
R33
C39
Q13
Q14
C12
C11
C9
R36
R34
C41
C40
C42
Q4
C23
C25
2
CN1
R29
R28
C26
C38
R56
IC3
C47
R55
IC2
R62
D11
C49
Q6
C16
R46
D12
Q7
IC4
R63
R16
R20
C19
C24
C51
C50
C48
R21
Q15
Q16
R39
R50
R17
C14
R15
D4
C20
R19
R18
D5
R38
R37
C43
TP3
C65
C19
SSE 3
3
1
B
A

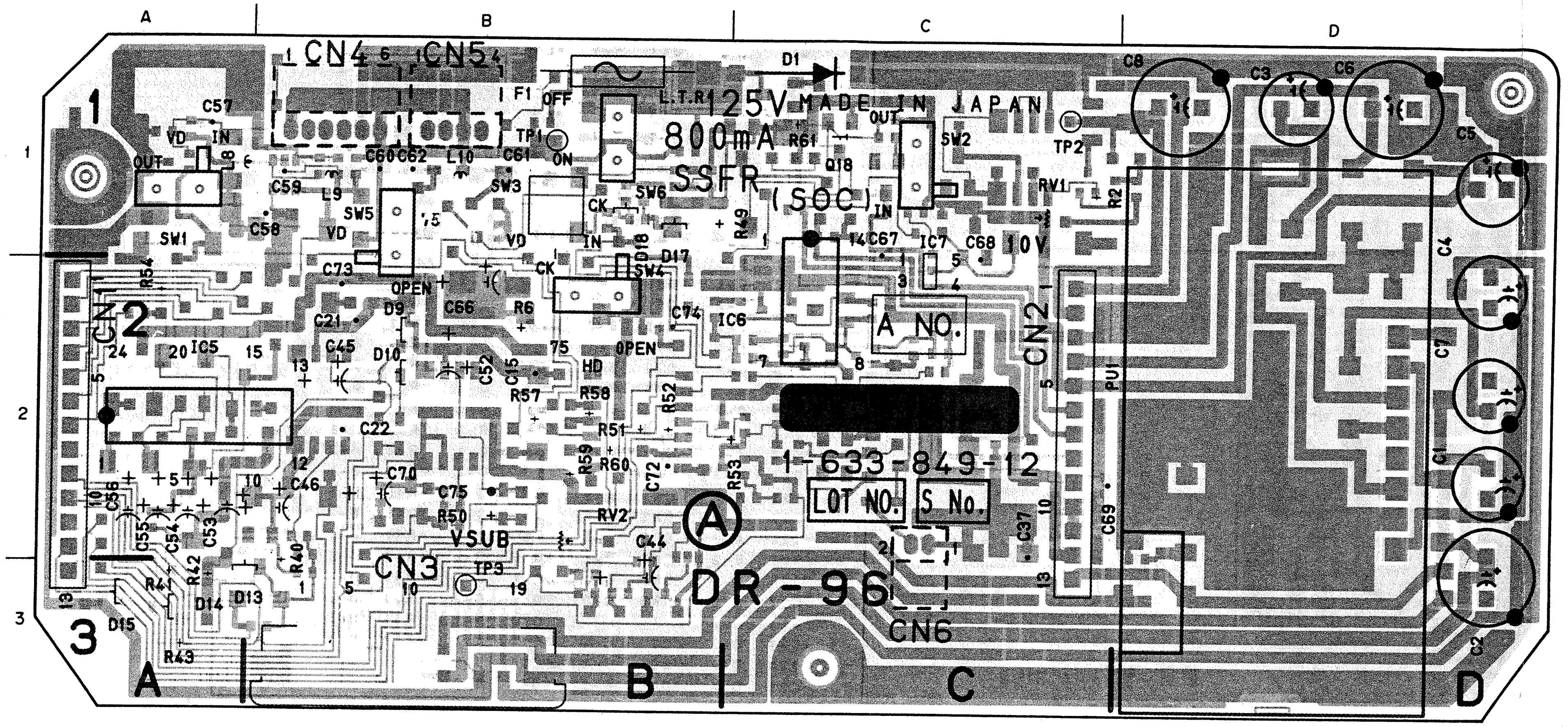
DR-96 -B SIDE-
1-633-849-11

DR-96 Board Location(1-633-849-11)

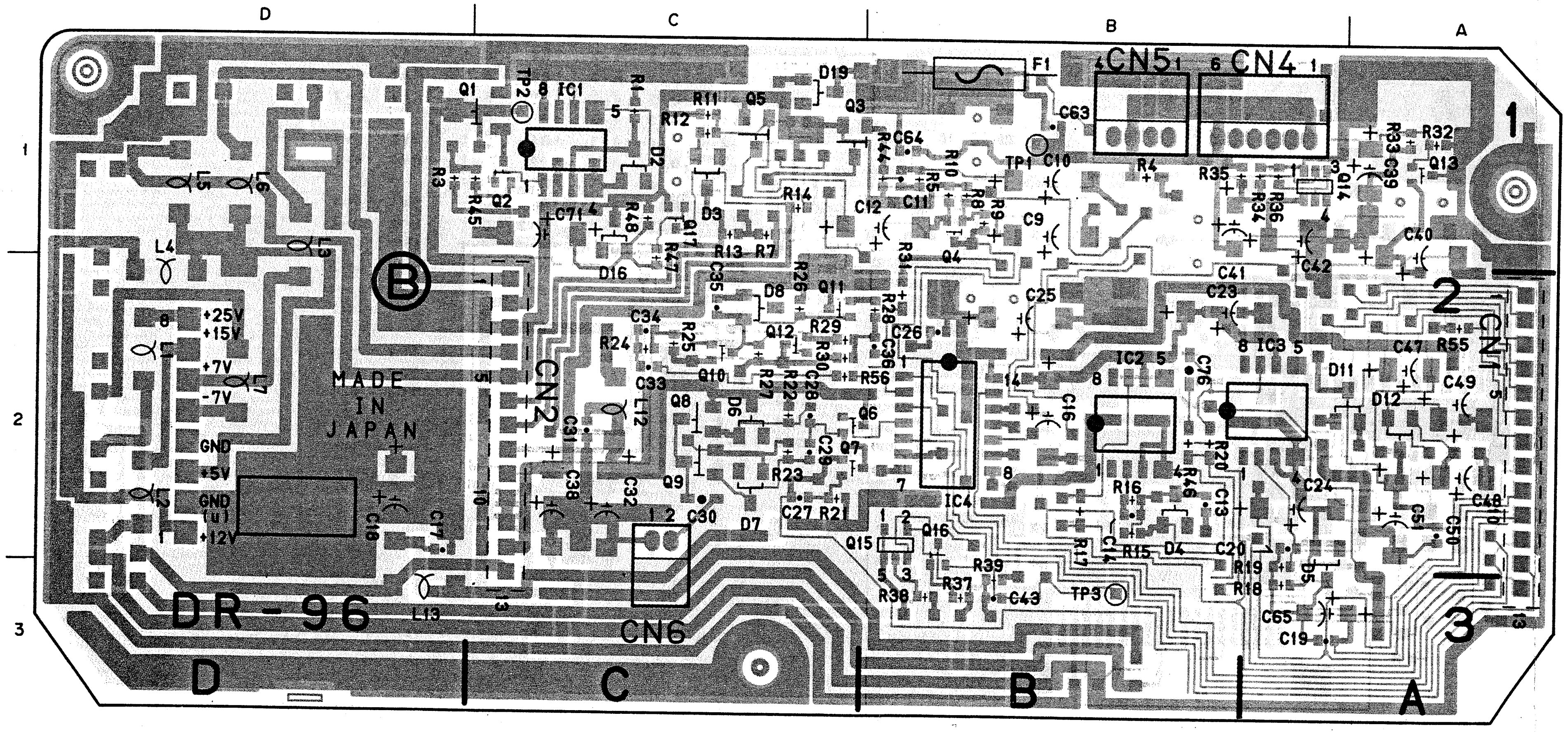
C1	D-2	C57	A-1	*L3	D-1	*R25	C-2
C2	D-3	C58	B-1	*L4	D-2	*R26	C-2
C3	D-1	C59	B-1	*L5	D-1	*R27	C-2
C4	D-2	C60	B-1	*L6	D-1	*R28	B-2
C5	D-1	C61	B-1	*L7	D-2	*R29	C-2
C6	D-1	C62	B-1	L8	A-1	*R30	C-2
C7	D-2	*C63	B-1	L9	B-1	*R31	B-2
C8	D-1	*C64	B-1	L10	B-1	*R32	A-1
*C9	B-1	*C65	A-3	*L12	C-2	*R33	A-1
*C10	B-1	C66	B-2	*L13	D-3	*R34	A-1
*C11	B-1	C67	C-2			*R35	B-1
*C12	B-1	C68	C-1	PU1	D-2	*R36	A-1
*C13	B-2	C69	C-2			*R37	B-3
*C14	B-2	C70	B-2	*Q1	C-1	*R38	B-3
C15	B-2	*C71	C-1	*Q2	C-1	*R39	B-3
*C16	B-2	C72	B-2	*Q3	C-1	R40	B-3
*C17	D-2			*Q4	B-1	R41	A-3
*C18	D-2	CN1	A-2	*Q5	C-1	R42	A-3
*C19	A-3	CN2	C-2	*Q6	C-2	R43	A-3
*C20	A-2	CN3	B-3	*Q7	C-2	*R44	B-1
C21	B-2	CN4	B-1	*Q8	C-2	*R45	C-1
C22	B-2	CN5	B-1	*Q9	C-2	*R46	B-2
*C23	B-2	*CN6	C-3	*Q10	C-2	*R47	C-1
*C24	A-2			*Q11	C-2	*R48	C-1
*C25	B-2	D1	C-1	*Q12	C-2	R49	B-1
*C26	B-2	*D2	C-1	*Q13	A-1	R50	B-2
*C27	C-2	*D3	C-1	*Q14	A-1	R51	B-2
*C28	C-2	*D4	B-2	*Q15	B-2	R52	B-2
*C29	C-2	*D5	A-2	*Q16	B-2	R53	C-2
*C30	C-2	*D6	C-2	*Q17	C-1	R54	A-2
*C31	C-2	*D7	C-2	Q18	C-1	*R55	A-2
*C32	C-2	*D8	C-2			*R56	C-2
*C33	C-2	D9	B-2	*R1	C-1	R57	B-2
*C34	C-2	D10	B-2	R2	C-1	R58	B-2
*C35	C-2	*D11	A-2	*R3	D-1	R59	B-2
*C36	B-2	*D12	A-2	*R4	B-1	R60	B-2
C37	C-2	D13	A-3	*R5	B-1	R61	C-1
*C38	C-2	D14	A-3	R6	B-2	*R62	B-2
*C39	A-1	D15	A-3	R7	C-1	*R63	B-2
*C40	A-1	*D16	C-1	*R8	B-1		
*C41	A-1	D17	B-1	*R9	B-1	RV1	C-1
*C42	A-1	D18	B-1	*R10	B-1	RV2	B-2
*C43	B-3	*D19	C-1	*R11	C-1		
C44	B-3			*R12	C-1	SW1	A-1
C45	B-2	F1	B-1	*R13	C-1	SW2	C-1
C46	B-2			*R14	C-1	SW3	B-1
*C47	A-2	*IC1	C-1	*R15	B-2	SW4	B-2
*C48	A-2	*IC2	B-2	*R16	B-2	SW5	B-1
*C49	A-2	*IC3	A-2	*R17	B-2	SW6	B-1
*C50	A-2	*IC4	B-2	*R18	A-3		
C51	A-2	IC5	A-2	*R19	A-2	TP1	B-1
C52	B-2	IC6	C-2	*R20	B-2	TP2	C-1
C53	A-2	IC7	C-2	*R21	C-2	TP3	B-3
C54	A-2			*R22	C-2		
C55	A-2	*L1	D-2	*R23	C-2		
C56	A-2	*L2	D-2	*R24	C-2		

*: B SIDE

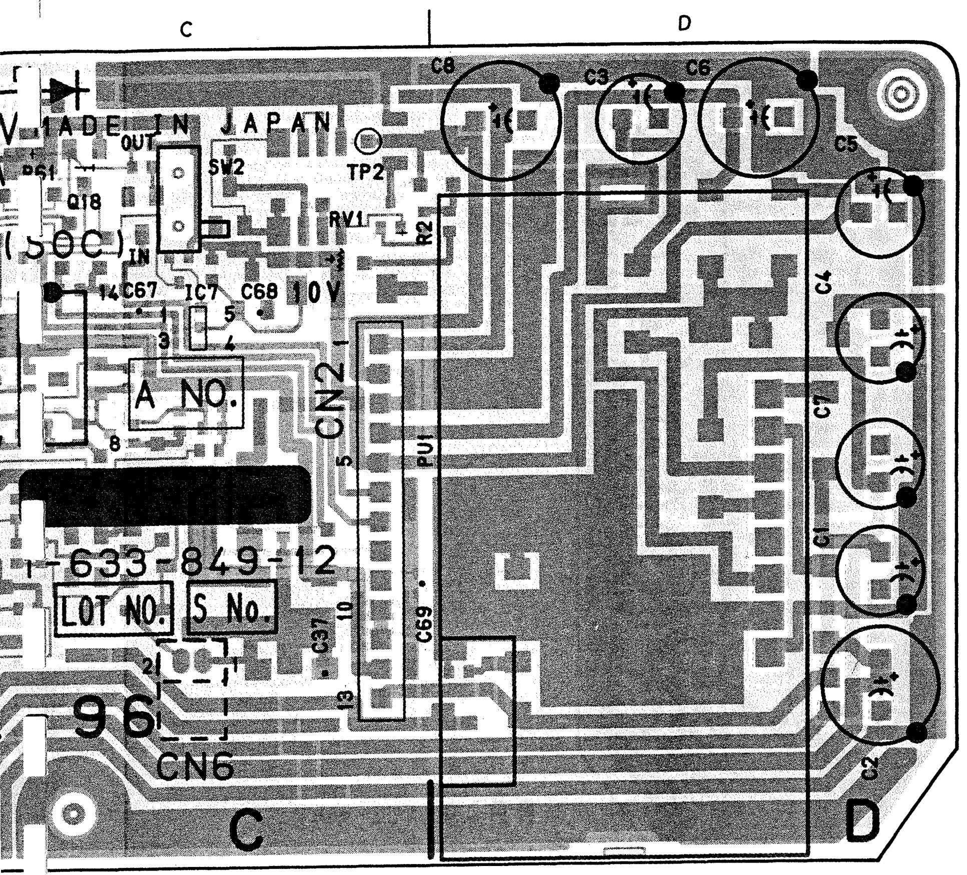
Mounting Diagram


A
B
C
D
1
2
3
CN4
CN5
F1
D1
125V MADE IN JAPAN
800mA
SSFR
(SOC)
L.T.R
OFF
ON
TP1
TP2
TP3
C57
VD
IN
OUT
C59
L9
SW1
SW2
SW3
SW4
SW5
SW6
C58
C60
C62
L10
C61
R61
Q18
RV1
R2
C8
C3
C6
C5
C4
C7
C1
C2
CK
OPEN
R49
C67
IC7
C68
10V
CN2
R54
C73
D9
C66
R6
D18
D17
C74
IC6
A NO.
PU1
IC5
C21
C45
D10
C52
C15
HD
R57
R58
R52
C22
R51
R59
R60
C72
R53
1-633-849-12
LOT NO.
S No.
C37
C69
C46
C70
C75
R50
VSUB
RV2
C44
Ⓐ
DR-96
CN3
CN6
C56
C55
C54
C53
R40
R42
R41
D14
D13
D15
R43

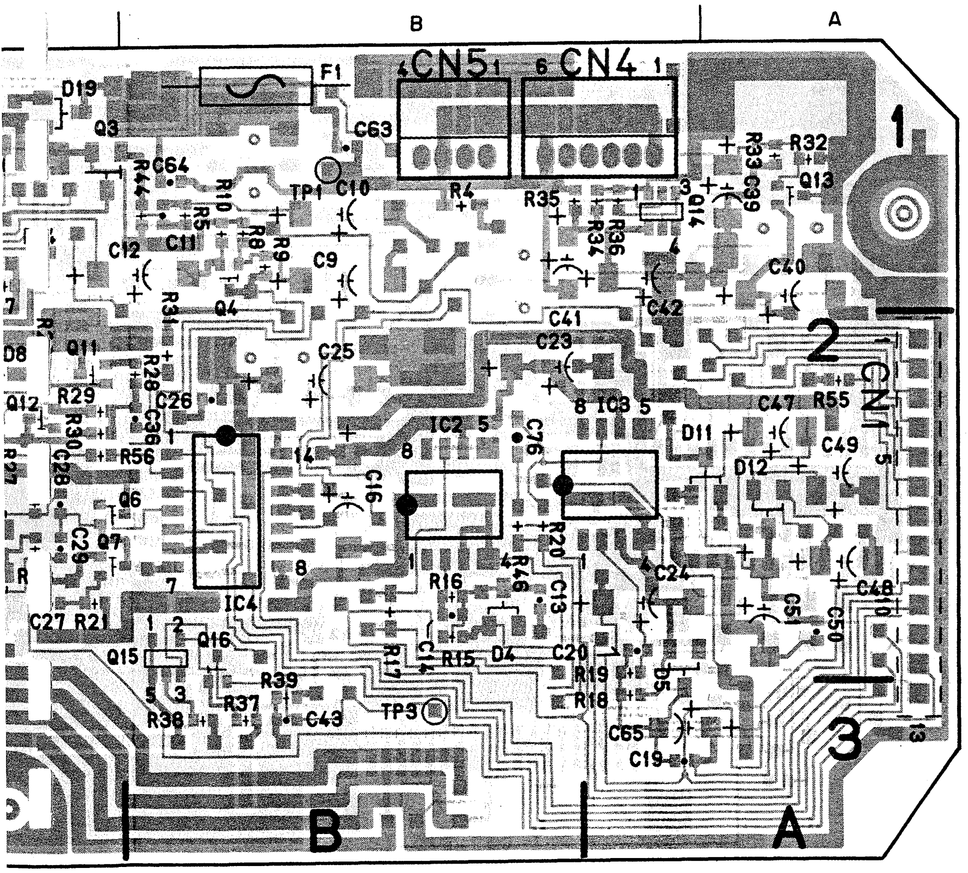
DR-96 -A SIDE-
1-633-849-12


D
C
B
A
1
2
3
Q1
TP2
IC1
R1
R11
Q5
D19
Q3
F1
CN5
CN4
R12
C63
C64
R44
R10
TP1
C10
R4
R35
R33
C39
R32
Q13
Q14
R34
R36
R3
R45
Q2
C71
R48
D2
Q17
D3
R14
R5
R8
R9
C12
C11
C9
C40
C42
C41
L5
L6
L4
L3
Ⓑ
D16
R47
R13
R7
R31
Q4
C23
C25
C35
D8
R26
Q11
R28
C26
C36
C34
R25
R24
Q12
R29
R30
R56
C33
Q10
R27
R22
C28
IC2
IC3
C76
C47
R55
D11
C49
D12
CN1
+25V
+15V
+7V
-7V
GND
+5V
GND
+12V
L1
L2
L7
MADE IN JAPAN
CN2
L12
C31
Q8
D6
C16
C38
C32
Q9
Q6
Q7
C29
R23
IC4
R16
R46
C13
R20
C24
C48
C51
C50
C18
C17
C30
D7
C27
R21
Q15
Q16
R39
R37
R38
C43
TP3
R17
C14
R15
D4
C20
R19
R18
D5
C65
C19
L13
DR-96
CN6

DR-96 -B SIDE-
1-633-849-12


C
D
MADE IN JAPAN
OUT
SW2
TP2
Q18
RV1
R2
(SOC)
IN
C8
C3
C6
C5
C4
C7
C1
C2
14
C67
IC7
C68
10V
3
5
4
A NO.
8
CN2
5
PU1
1-633-849-12
LOT NO.
S No.
C37
10
C69
21
13
96
CN6
C
D

DR-96 -A SIDE-
1-633-849-12


B
A
D19
F1
CN5
CN4
Q3
C63
R32
R33
C39
Q13
R44
C64
R10
R5
TP1
C10
R4
R35
R34
R36
Q14
C12
C11
R8
R9
C9
C40
R31
Q4
C42
C41
C23
2
CN1
D8
Q11
R28
C25
Q12
R29
C26
IC2
8
IC3
C47
R55
R30
C36
R56
C16
C76
D11
C49
C28
D12
Q6
C29
Q7
R20
R16
R46
C13
C24
C51
C50
C48
IC4
8
7
C27
R21
Q16
R17
R15
D4
C20
Q15
R39
R19
D5
R38
R37
C43
TP3
R18
C65
C19
3
13
1
B
A

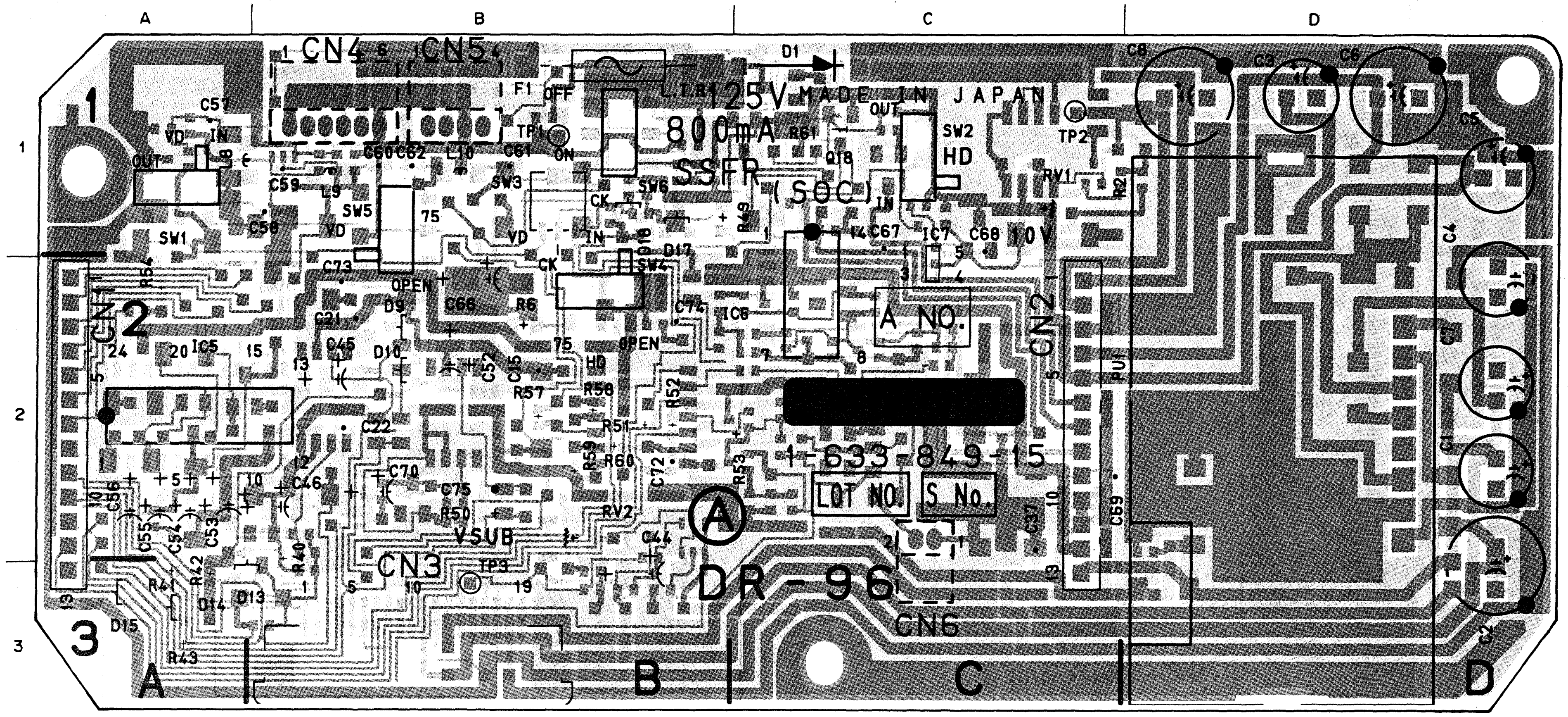
DR-96 -B SIDE-
1-633-849-12

DR-96 Board Location(1-633-849-12)

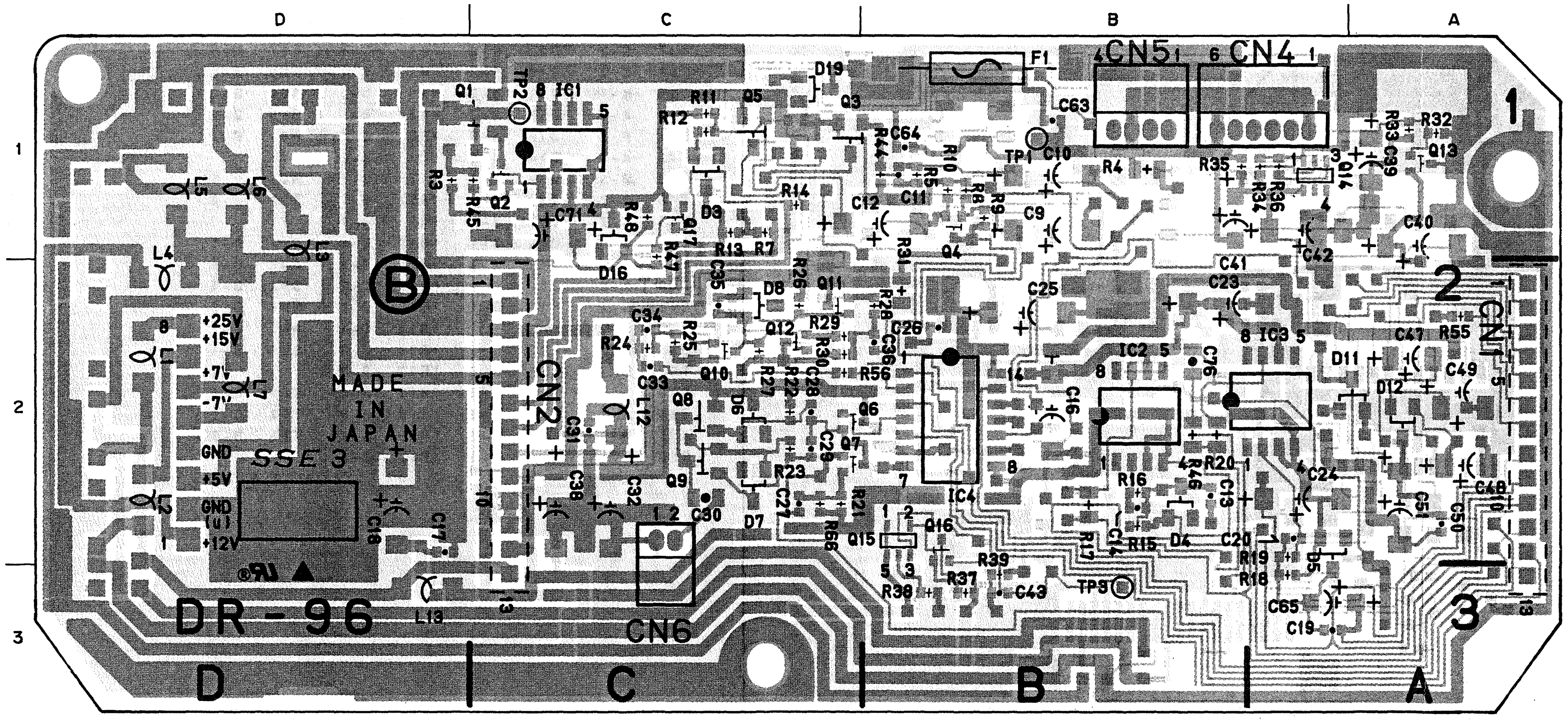
C1	D-2	C57	A-1	IC7	C-2	*R21	C-2
C2	D-3	C58	B-1			*R22	C-2
C3	D-1	C59	B-1	*L1	D-2	*R23	C-2
C4	D-2	C60	B-1	*L2	D-2	*R24	C-2
C5	D-1	C61	B-1	*L3	D-1	*R25	C-2
C6	D-1	C62	B-1	*L4	D-2	*R26	C-2
C7	D-2	*C63	B-1	*L5	D-1	*R27	C-2
C8	D-1	*C64	B-1	*L6	D-1	*R28	B-2
*C9	B-1	*C65	A-3	*L7	D-2	*R29	C-2
*C10	B-1	C66	B-2	L8	A-1	*R30	C-2
*C11	B-1	C67	C-2	L9	B-1	*R31	B-2
*C12	B-1	C68	C-1	L10	B-1	*R32	A-1
*C13	B-2	C69	C-2	*L12	C-2	*R33	A-1
*C14	B-2	C70	B-2	*L13	D-3	*R34	A-1
C15	B-2	*C71	C-1			*R35	B-1
*C16	B-2	C72	B-2	PU1	D-2	*R36	A-1
*C17	D-2	C73	B-2			*R37	B-3
*C18	D-2	C74	B-2	*Q1	C-1	*R38	B-3
*C19	A-3	C75	B-2	*Q2	C-1	*R39	B-3
*C20	A-2	*C76	B-2	*Q3	C-1	R40	B-3
C21	B-2			*Q4	B-1	R41	A-3
C22	B-2	CN1	A-2	*Q5	C-1	R42	A-3
*C23	B-2	CN2	C-2	*Q6	C-2	R43	A-3
*C24	A-2	CN3	B-3	*Q7	C-2	*R44	B-1
*C25	B-2	CN4	B-1	*Q8	C-2	*R45	C-1
*C26	B-2	CN5	B-1	*Q9	C-2	*R46	B-2
*C27	C-2	*CN6	C-3	*Q10	C-2	*R47	C-1
*C28	C-2			*Q11	C-2	*R48	C-1
*C29	C-2	D1	C-1	*Q12	C-2	R49	B-1
*C30	C-2	*D2	C-1	*Q13	A-1	R50	B-2
*C31	C-2	*D3	C-1	*Q14	A-1	R51	B-2
*C32	C-2	*D4	B-2	*Q15	B-2	R52	B-2
*C33	C-2	*D5	A-2	*Q16	B-2	R53	C-2
*C34	C-2	*D6	C-2	*Q17	C-1	R54	A-2
*C35	C-2	*D7	C-2	Q18	C-1	*R55	A-2
*C36	B-2	*D8	C-2			*R56	C-2
C37	C-2	D9	B-2	*R1	C-1	R57	B-2
*C38	C-2	D10	B-2	R2	C-1	R58	B-2
*C39	A-1	*D11	A-2	*R3	D-1	R59	B-2
*C40	A-1	*D12	A-2	*R4	B-1	R60	B-2
*C41	B-2	D13	A-3	*R5	B-1	R61	C-1
*C42	A-1	D14	A-3	R6	B-2		
*C43	B-3	D15	A-3	*R7	C-1	RV1	C-1
C44	B-3	*D16	C-1	*R8	B-1	RV2	B-2
C45	B-2	D17	B-1	*R9	B-1		
C46	B-2	D18	B-1	*R10	B-1	SW1	A-1
*C47	A-2	*D19	C-1	*R11	C-1	SW2	C-1
*C48	A-2			*R12	C-1	SW3	B-1
*C49	A-2	F1	B-1	*R13	C-1	SW4	B-2
*C50	A-2			*R14	C-1	SW5	B-1
*C51	A-2	*IC1	C-1	*R15	B-2	SW6	B-1
C52	B-2	*IC2	B-2	*R16	B-2		
C53	A-2	*IC3	A-2	*R17	B-2	TP1	B-1
C54	A-2	*IC4	B-2	*R18	A-3	TP2	C-1
C55	A-2	IC5	A-2	*R19	A-2	TP3	B-3
C56	A-2	IC6	C-2	*R20	B-2		

*: B SIDE

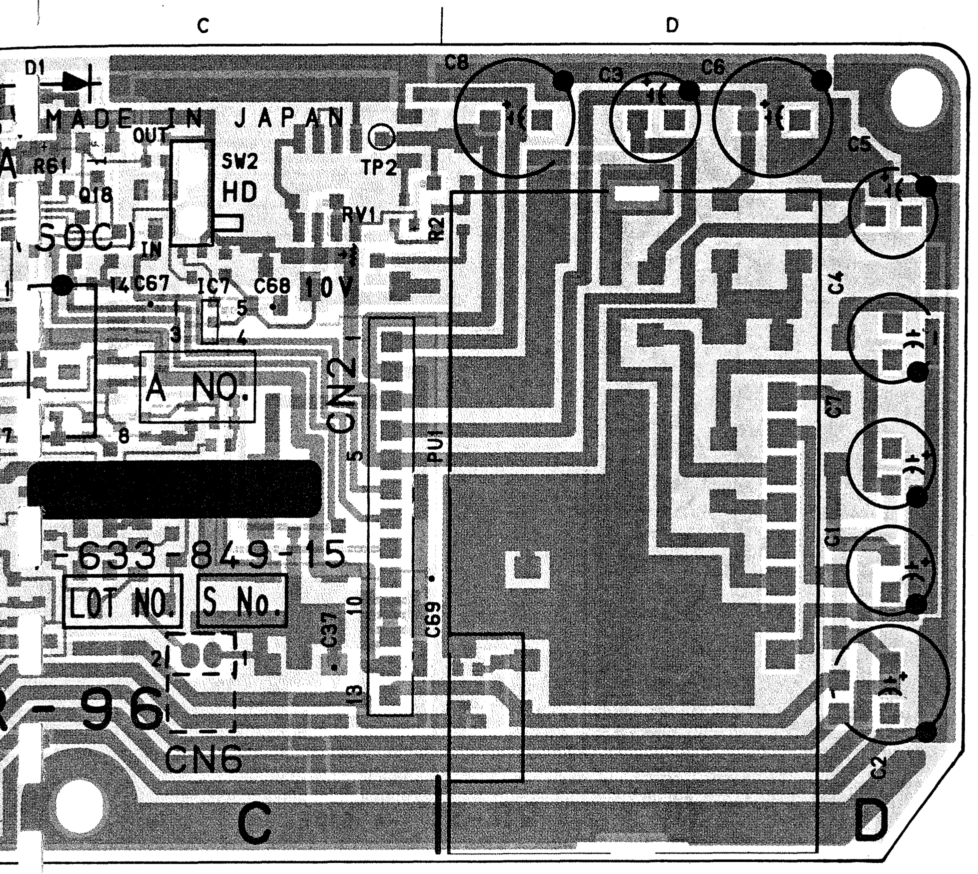
Mounting Diagram


A
B
C
D
1
2
3
CN4
CN5
F1
D1
125V
800mA
SSFR
(SOC)
MADE IN JAPAN
TP1
TP2
SW1
SW2
SW3
SW4
SW5
SW6
HD
VD
CK
OPEN
C57
C58
C59
C60
C62
C61
L9
L10
C73
C66
R6
C21
C45
D9
D10
IC5
IC6
IC7
C67
C68
10V
R61
Q18
RV1
R42
D17
C74
R49
A NO.
CN1
CN2
CN3
CN6
C22
C46
C70
C75
R50
R57
R58
R51
R52
R53
R59
R60
C72
RV2
VSUB
TP3
C44
C56
C55
C54
C53
R41
R40
D13
D14
D15
R43
LOT NO.
S No.
1-633-849-15
DR-96
C37
C69
C8
C3
C6
C5
C4
C7
C1
C2
PU
C
Ⓐ

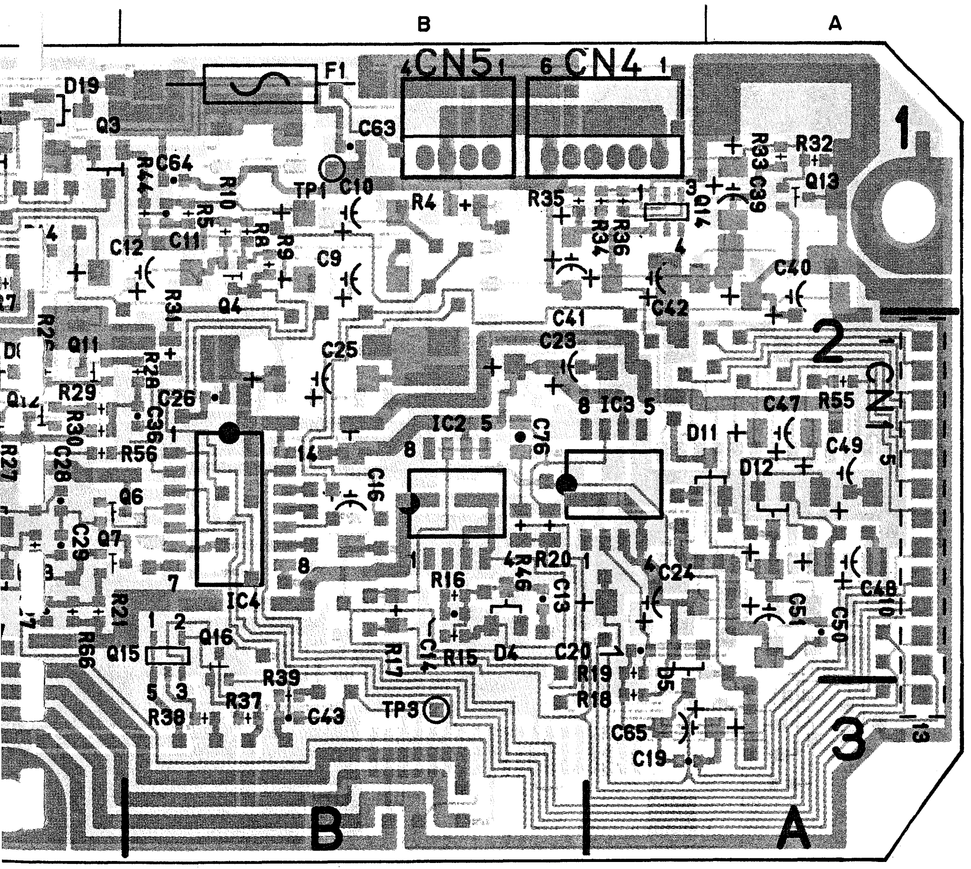
DR-96 -A SIDE-
1-633-849-15


D
C
B
A
1
2
3
Ⓑ
TP2
Q1
IC1
R11
R12
Q5
D19
Q3
F1
CN5
CN4
C63
TP1
C10
R4
R35
R33
C99
R32
Q13
Q14
R3
Q2
R15
C71
R48
Q17
D9
R14
C64
R44
C12
C11
R10
R5
R8
R9
R34
R36
C9
C40
C42
R31
Q4
L4
D16
R13
R7
R47
C35
D8
R26
Q11
R28
C26
C25
C41
C23
C34
R25
Q12
R29
R30
C36
IC2
IC3
C76
C47
R55
D11
C49
D12
+25V
+15V
+7V
-7V
GND
+5V
GND
+12V
R24
C33
Q10
R27
R22
C28
R56
C16
C24
C48
MADE IN JAPAN
SSE 3
L12
Q8
D6
Q6
Q7
C29
IC4
R16
R46
R20
C13
C51
C50
C31
C38
C32
Q9
C30
R23
C27
D7
R21
R66
Q15
Q16
C14
R17
R15
D4
C20
R19
R18
D5
C18
C17
L13
CN2
CN6
CN1
R37
R39
R38
C43
TP5
C65
C19
DR-96

DR-96 -B SIDE-
1-633-849-15


C
D
D1
MADE IN JAPAN
OUT
IN
SW2
HD
TP2
RV1
R2
R61
Q18
C8
C3
C6
C5
C4
C7
C1
C2
C67
IC7
C68
10V
A NO.
CN2
PU1
633-849-15
LOT NO.
S No.
C37
C69
CN6
C
D

DR-96 -A SIDE-
1-633-849-15


B
A
D19
F1
CN5
CN4
Q3
C63
R33
R32
C39
Q13
Q14
C64
R44
R10
R5
TP1
C10
R4
R35
R36
R34
C12
C11
R8
R9
C9
C40
C42
R31
Q4
C41
C23
C25
Q11
R28
R29
C26
R30
C36
R56
IC2
IC3
C47
R55
D11
C49
C76
D12
C16
Q6
C28
C29
Q7
IC4
R16
R46
R20
C13
C24
C51
C48
C50
R21
Q15
Q16
R17
C14
R15
D4
C20
R19
R18
D5
R66
R39
R37
C43
TP3
R38
C65
C19
CN1
1
2
3
13
B
A

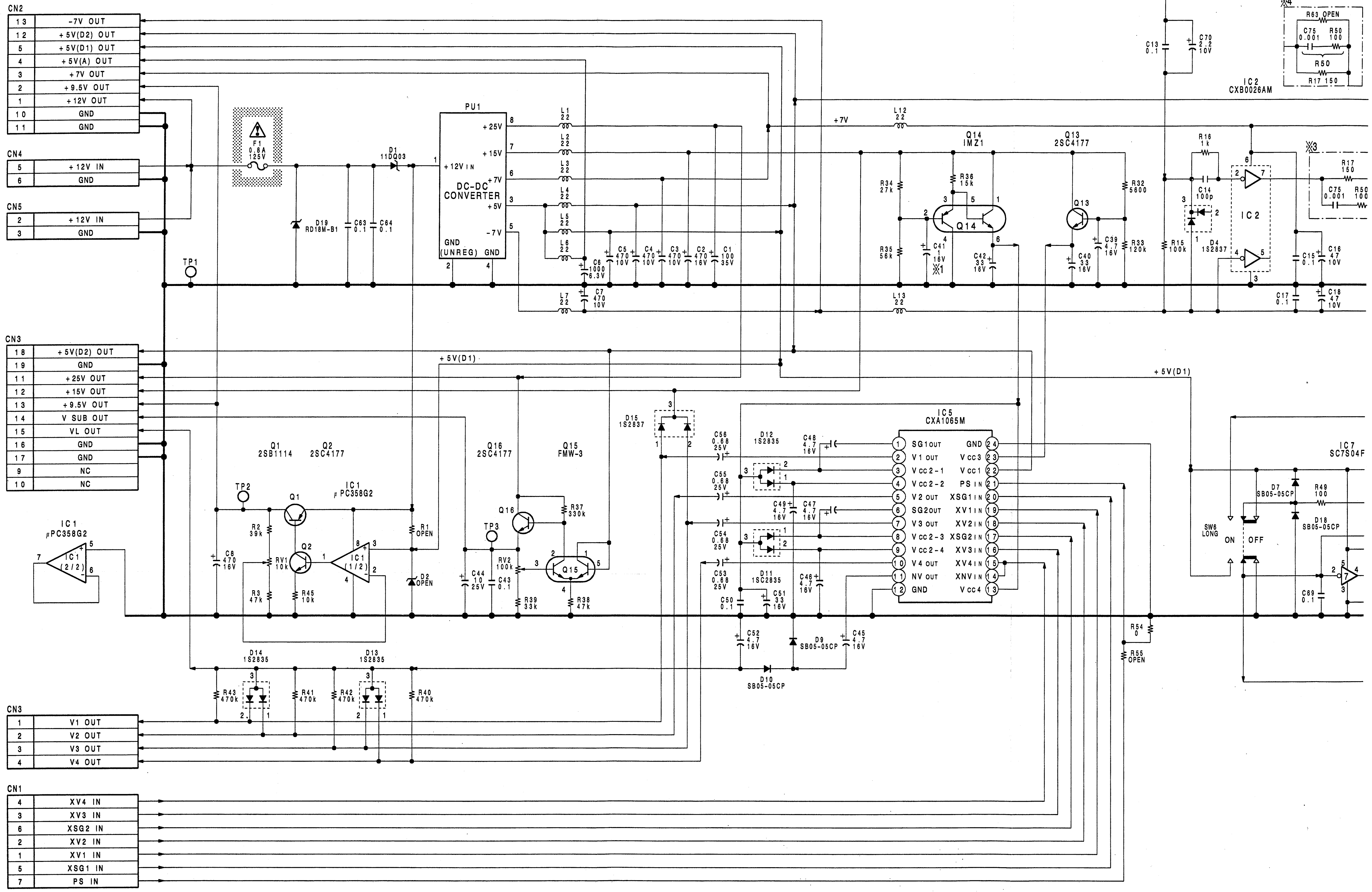
DR-96 -B SIDE-
1-633-849-15

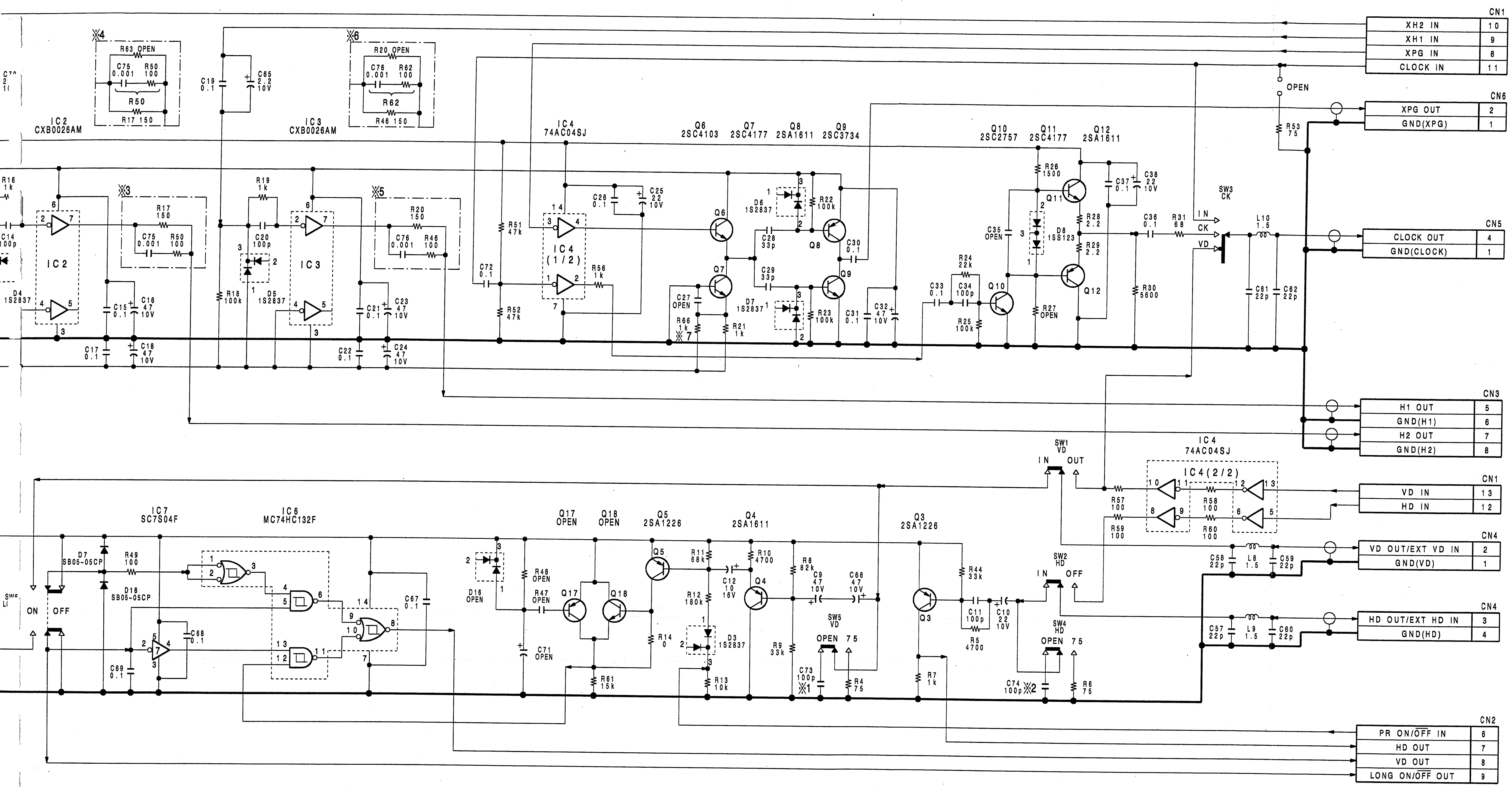
DR-96 Board Location(1-633-849-15)

C1	D-2	C57	A-1	*L1	D-2	*R24	C-2
C2	D-3	C58	B-1	*L2	D-2	*R25	C-2
C3	D-1	C59	B-1	*L3	D-1	*R26	C-2
C4	D-2	C60	B-1	*L4	D-2	*R27	C-2
C5	D-1	C61	B-1	*L5	D-1	*R28	B-2
C6	D-1	C62	B-1	*L6	D-1	*R29	C-2
C7	D-2	*C63	B-1	*L7	D-2	*R30	C-2
C8	D-1	*C64	B-1	L8	A-1	*R31	B-2
*C9	B-1	*C65	A-3	L9	B-1	*R32	A-1
*C10	B-1	C66	B-2	L10	B-1	*R33	A-1
*C11	B-1	C67	C-2	*L12	C-2	*R34	A-1
*C12	B-1	C68	C-1	*L13	D-3	*R35	B-1
*C13	B-2	C69	C-2			*R36	A-1
*C14	B-2	C70	B-2	PU1	D-2	*R37	B-3
C15	B-2	*C71	C-1			*R38	B-3
*C16	B-2	C72	B-2	*Q1	C-1	*R39	B-3
*C17	D-2	C73	B-2	*Q2	C-1	R40	B-3
*C18	D-2	C74	B-2	*Q3	C-1	R41	A-3
*C19	A-3	C75	B-2	*Q4	B-1	R42	A-3
*C20	A-2	*C76	B-2	*Q5	C-1	R43	A-3
C21	B-2			*Q6	C-2	*R44	B-1
C22	B-2	CN1	A-2	*Q7	C-2	*R45	C-1
*C23	B-2	CN2	C-2	*Q8	C-2	*R46	B-2
*C24	A-2	CN3	B-3	*Q9	C-2	*R47	C-1
*C25	B-2	CN4	B-1	*Q10	C-2	*R48	C-1
*C26	B-2	CN5	B-1	*Q11	C-2	R49	B-1
*C27	C-2	*CN6	C-3	*Q12	C-2	R50	B-2
*C28	C-2			*Q13	A-1	R51	B-2
*C29	C-2	D1	C-1	*Q14	A-1	R52	B-2
*C30	C-2	*D3	C-1	*Q15	B-2	R53	C-2
*C31	C-2	*D4	B-2	*Q16	B-2	R54	A-2
*C32	C-2	*D5	A-2	*Q17	C-1	*R55	A-2
*C33	C-2	*D6	C-2	Q18	C-1	*R56	C-2
*C34	C-2	*D7	C-2			R57	B-2
*C35	C-2	*D8	C-2	R2	C-1	R58	B-2
*C36	B-2	D9	B-2	*R3	D-1	R59	B-2
C37	C-2	D10	B-2	*R4	B-1	R60	B-2
*C38	C-2	*D11	A-2	*R5	B-1	R61	C-1
*C39	A-1	*D12	A-2	R6	B-2	R66	C-2
*C40	A-1	D13	A-3	*R7	C-1		
*C41	B-2	D14	A-3	*R8	B-1	RV1	C-1
*C42	A-1	D15	A-3	*R9	B-1	RV2	B-2
*C43	B-3	*D16	C-1	*R10	B-1		
C44	B-3	D17	B-1	*R11	C-1	SW1	A-1
C45	B-2	D18	B-1	*R12	C-1	SW2	C-1
C46	B-2	*D19	C-1	*R13	C-1	SW3	B-1
*C47	A-2			*R14	C-1	SW4	B-2
*C48	A-2	F1	B-1	*R15	B-2	SW5	B-1
*C49	A-2			*R16	B-2	SW6	B-1
*C50	A-2	*IC1	C-1	*R17	B-2		
*C51	A-2	*IC2	B-2	*R18	A-3	TP1	B-1
C52	B-2	*IC3	A-2	*R19	A-2	TP2	C-1
C53	A-2	*IC4	B-2	*R20	B-2	TP3	B-3
C54	A-2	IC5	A-2	*R21	C-2		
C55	A-2	IC6	C-2	*R22	C-2		
C56	A-2	IC7	C-2	*R23	C-2		

*: B SIDE

Schmatic Diagram


CN2
13 -7V OUT
12 +5V(D2) OUT
5 +5V(D1) OUT
4 +5V(A) OUT
3 +7V OUT
2 +9.5V OUT
1 +12V OUT
10 GND
11 GND
CN4
5 +12V IN
6 GND
CN5
2 +12V IN
3 GND
TP1
F1 0.8A 125V
D1 11DQ03
D19 RD18M-B1
C63 0.1
C64 0.1
PU1
DC-DC CONVERTER
+12V IN
+25V
+15V
+7V
+5V
-7V
GND (UNREG)
GND
L1 22
L2 22
L3 22
L4 22
L5 22
L6 22
L7 22
C6 1000 6.3V
C5 470 10V
C4 470 10V
C3 470 10V
C2 470 16V
C1 100 35V
C7 470 10V
+7V
L12 22
L13 22
Q14 IMZ1
Q13 2SC4177
R36 15k
R34 27k
R35 56k
C41 1 16V
※1
C42 33 16V
C40 33 16V
C39 4.7 16V
R32 5600
R33 120k
C13 0.1
C70 2.2 10V
※4
R63 OPEN
C75 0.001
R50 100
R50
R17 150
IC2 CXB0026AM
R16 1k
C14 100p
D4 1S2837
R15 100k
IC2
C15 0.1
C16 47 10V
C17 0.1
C18 47 10V
※3
R17 150
C75 0.001
R50 100
CN3
18 +5V(D2) OUT
19 GND
11 +25V OUT
12 +15V OUT
13 +9.5V OUT
14 V SUB OUT
15 VL OUT
16 GND
17 GND
9 NC
10 NC
+5V(D1)
+5V(D1)
D15 1S2837
Q1 2SB1114
Q2 2SC4177
Q16 2SC4177
Q15 FMW-3
IC1 μPC358G2
IC1 (1/2)
IC1 μPC358G2
IC1 (2/2)
TP2
TP3
R2 39k
RV1 10k
R3 47k
R45 10k
C8 470 16V
R1 OPEN
D2 OPEN
C44 10 25V
C43 0.1
RV2 100k
R37 330k
R39 33k
R38 47k
D12 1S2835
D11 1SC2835
C56 0.68 25V
C55 0.68 25V
C54 0.68 25V
C53 0.68 25V
C48 4.7 16V
C49 4.7 16V
C47 4.7 16V
C46 4.7 16V
C50 0.1
C51 33 16V
C52 4.7 16V
C45 4.7 16V
D9 SB05-05CP
D10 SB05-05CP
IC5 CXA1065M
1 SG1OUT
2 V1 OUT
3 Vcc2-1
4 Vcc2-2
5 V2 OUT
6 SG2OUT
7 V3 OUT
8 Vcc2-3
9 Vcc2-4
10 V4 OUT
11 NV OUT
12 GND
24 GND
23 Vcc3
22 Vcc1
21 PS IN
20 XSG1 IN
19 XV1 IN
18 XV2 IN
17 XSG2 IN
16 XV3 IN
15 XV4 IN
14 XNV IN
13 Vcc4
R54 0
R55 OPEN
IC7 SC7S04F
SW6 LONG
ON
OFF
D7 SB05-05CP
R49 100
D18 SB05-05CP
C69 0.1
D14 1S2835
D13 1S2835
R43 470k
R41 470k
R42 470k
R40 470k
CN3
1 V1 OUT
2 V2 OUT
3 V3 OUT
4 V4 OUT
CN1
4 XV4 IN
3 XV3 IN
6 XSG2 IN
2 XV2 IN
1 XV1 IN
5 XSG1 IN
7 PS IN


CN1
XH2 IN 10
XH1 IN 9
XPG IN 8
CLOCK IN 11
OPEN
CN6
XPG OUT 2
GND(XPG) 1
CN5
CLOCK OUT 4
GND(CLOCK) 1
CN3
H1 OUT 5
GND(H1) 6
H2 OUT 7
GND(H2) 8
CN1
VD IN 13
HD IN 12
CN4
VD OUT/EXT VD IN 2
GND(VD) 1
CN4
HD OUT/EXT HD IN 3
GND(HD) 4
CN2
PR ON/OFF IN 6
HD OUT 7
VD OUT 8
LONG ON/OFF OUT 9
IC2 CXB0026AM
IC3 CXB0026AM
IC4 74AC04SJ
IC4 (1/2)
IC4 74AC04SJ
IC4(2/2)
IC7 SC7S04F
IC6 MC74HC132F
Q6 2SC4103
Q7 2SC4177
Q8 2SA1611
Q9 2SC3734
Q10 2SC2757
Q11 2SC4177
Q12 2SA1611
Q17 OPEN
Q18 OPEN
Q5 2SA1226
Q4 2SA1611
Q3 2SA1226
※4
※6
※3
※5
※7
※1
※2
R63 OPEN
C75 0.001
R50 100
R17 150
R20 OPEN
C76 0.001
R62 100
R46 150
C19 0.1
C65 2.2 10V
R16 1k
C14 100p
D4 1S2837
C15 0.1
C16 47 10V
C17 0.1
C18 47 10V
R19 1k
C20 100p
D5 1S2837
R18 100k
C21 0.1
C23 47 10V
C22 0.1
C24 47 10V
R51 47k
R52 47k
C72 0.1
C26 0.1
C25 22 10V
R56 1k
C27 OPEN
R66 1k
R21 1k
D6 1S2837
R22 100k
C28 33p
C29 33p
D7 1S2837
R23 100k
C30 0.1
C31 0.1
C32 47 10V
R24 22k
C33 0.1
C34 100p
R25 100k
C35 OPEN
R26 1500
D8 1SS123
R28 2.2
R29 2.2
R27 OPEN
C37 0.1
C38 22 10V
C36 0.1
R31 68
R30 5600
SW3 CK
IN
CK
VD
L10 1.5
C61 22p
C62 22p
R53 75
SW1 VD
IN OUT
R57 100
R59 100
R58 100
R60 100
SW2 HD
IN OFF
L8 1.5
C58 22p
C59 22p
L9 1.5
C57 22p
C60 22p
D7 SB05-05CP
D18 SB05-05CP
R49 100
ON OFF
C68 0.1
C69 0.1
C67 0.1
D16 OPEN
R48 OPEN
R47 OPEN
C71 OPEN
R61 15k
R11 68k
R10 4700
R12 180k
C12 10 16V
R14 0
D3 1S2837
R13 10k
R8 82k
C9 47 10V
C66 47 10V
R9 33k
SW5 VD
OPEN 75
C73 100p
R4 75
R44 33k
C11 100p
C10 22 10V
R5 4700
R7 1k
SW4 HD
OPEN 75
C74 100p
R6 75

※1: TENTATIVE ADDITIONAL PARTS IN SUFFIX-11.
※2: ONLY SUFFIX-12.
※3: ONLY SUFFIX-12. WHEN SUFFIX-11 IS ※4.
※4: ONLY SUFFIX-11.
※5: ONLY SUFFIX-12. WHEN SUFFIX-11 IS ※6.
※6: ONLY SUFFIX-11.
※7: R64 BE MOUNTED ON R21 IN SUFFIX-11

DR-96
1-633-849-11,12,15
XC-77RR(UCJ)
XC-77RR-CE(EK)

SECTION B
SEMICONDUCTOR

The circuit diagram of IC is obtaind from the IC data book published by the manufacture.

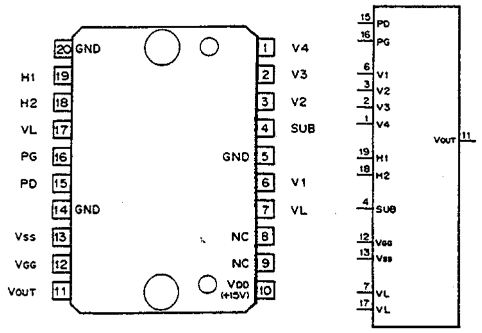
	TYPE	PAGE
IC	74AC04SJ	B-3
	CXA1065M	B-2
	CXA1118M	B-3
	CXA1119M	B-3
	CXB0026AM	B-2
	ICX022AL	B-2
	ICX024AL	B-2
	MC74HC132F	B-3
	MC74HC4052F	B-3
	MC74HC4053F	B-3
	NJM7808FA	B-3
	RC7808FA	B-3
	SC7S04F	B-2
	μPC358G2	B-3

	TYPE	PAGE
DIODE	11DQ03	ALL B-4
	1S1555	
	1S2835	
	1S2836	
	1S2837	
	1SS119	
	1SS123	
	1SS226	
	1SS303	
	1SS304	
	MA121	
	MA152WK	
	RD18M-B1	
	RD5.1M-B2	
	SB05-05CP	
	TLG208	
TRANSISTOR	2SA1162	
	2SA1226	
	2SA1461	
	2SA1611	
	2SA812	
	2SB1114	
	2SB1121	
	2SC1623	
	2SC2757	
	2SC3734	
	2SC4081	
	2SC4103	
	2SC4177	
	3SK163	
	FMW-10	
	FMW-2	
	FMW-3	
	FMW-5	
	IMX4	
	IMZ1	

IC

ICX022AL (SONY) (NTSC)
ICX024AL (SONY) (PAL)

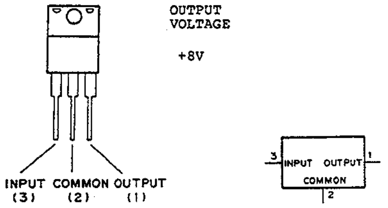
CCD IMAGE BLOCK FOR B/W CAMERA
- BOTTOM VIEW -


20 GND
H1 19
H2 18
VL 17
PG 16
PD 15
14 GND
Vss 13
VGG 12
VOUT 11
1 V4
2 V3
3 V2
4 SUB
GND 5
6 V1
7 VL
NC 8
NC 9
VDD (+15V) 10
15 PD
16 PG
6 V1
3 V2
2 V3
1 V4
19 H1
18 H2
4 SUB
12 VGG
13 VSS
7 VL
17 VL
VOUT 11

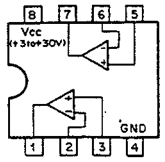
H1, H2 : TRANSFER CLOCK INPUTS OF HORIZONTAL SHIFT REGISTER
PD : PRECHARGE DRAIN BIAS INPUT
PG : OUTPUT RESET CLOCK INPUT
SUB : SUBSTRATUM
V1 – V4 : TRANSFER CLOCK INPUTS OF VERTICAL SHIFT REGISTER
V_{GG} : GATE BIAS INPUT FOR OUTPUT AMP.
VL : BIAS INPUT FOR LOOKOUT TRANSISTOR
V_{OUT} : SIGNAL OUTPUT
V_{SS} : SOURCE BIAS INPUT FOR OUTPUT AMP.

NJM7808FA (JRC) (1A)
RC7808FA (RAYTHEON) (1A)

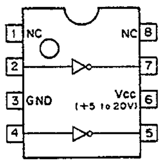
POSITIVE VOLTAGE REGULATOR
- FRONT VIEW -


OUTPUT VOLTAGE
+8V
INPUT (3)
COMMON (2)
OUTPUT (1)
3 INPUT
OUTPUT 1
COMMON
2

uPC358G2 (NEC) FLAT PACKAGE
DUAL OPERATIONAL AMPLIFIERS
— TOP VIEW —

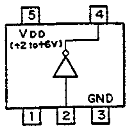

8
7
6
5
Vcc (+3to+30V)
GND
1
2
3
4

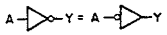
CXB0026AM (SONY) FLAT PACKAGE
BIPOLAR MOS CLOCK DRIVER
— TOP VIEW —


1 NC
2
3 GND
4
NC 8
7
Vcc (+5 to 20V) 6
5

SC7S04F (MOTOROLA) FLAT PACKAGE

C-MOS INVERTER
- TOP VIEW -


5
4
VDD (+2 to+6V)
GND
1
2
3

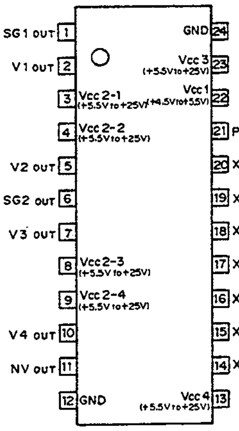


$Y = \overline{A}$

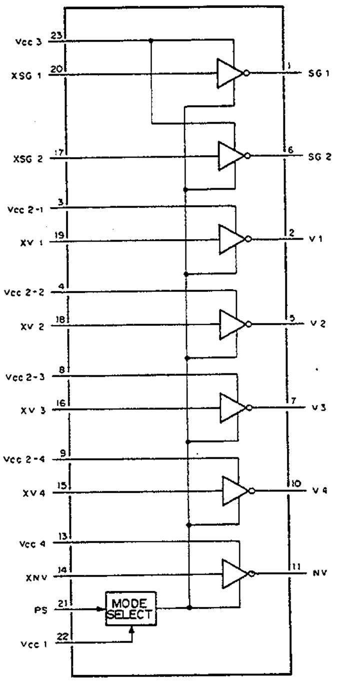
A	Y
0	1
1	0

0; LOW LEVEL
1; HIGH LEVEL

CXA1065M (SONY) FLAT PACKAGE
INVERTING DRIVER FOR CCD CLOCK WITH POWER SAVE
— TOP VIEW —

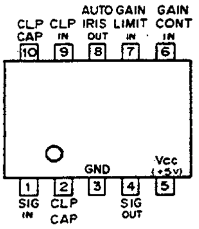

SG1 OUT 1
V1 OUT 2
3 Vcc 2-1 (+5.5V to +25V)
4 Vcc 2-2 (+5.5V to +25V)
V2 OUT 5
SG2 OUT 6
V3 OUT 7
8 Vcc 2-3 (+5.5V to +25V)
9 Vcc 2-4 (+5.5V to +25V)
V4 OUT 10
NV OUT 11
12 GND
GND 24
Vcc 3 (+5.5V to +25V) 23
Vcc 1 (+4.5V to +5.5V) 22
21 PS IN
20 XSG1 IN
19 XV1 IN
18 XV2 IN
17 XSG2 IN
16 XV3 IN
15 XV4 IN
14 XNV IN
Vcc 4 (+5.5V to +25V) 13

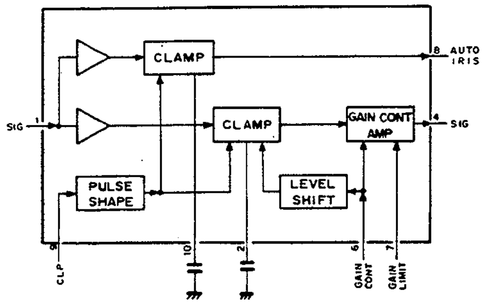
XV1-XV4 ; VERTICAL REGISTER TRANSMISSION CLOCK INPUT
V1 - V4 ; VERTICAL REGISTER TRANSMISSION CLOCK OUTPUT
XSG1, XSG2 ; SENSER GATE PULSE INPUT
SG1, SG2 ; SENSER GATE PULSE OUTPUT
XNV ; DRIVER INPUT
NV ; DRIVER OUTPUT
PS ; POWER SAVE INPUT
Vcc 1 ; BIAS VOLTAGE
Vcc 2-1 ; V1 OUTPUT PULSE VOLTAGE
Vcc 2-2 ; V2 OUTPUT PULSE VOLTAGE
Vcc 2-3 ; V3 OUTPUT PULSE VOLTAGE
Vcc 2-4 ; V4 OUTPUT PULSE VOLTAGE
Vcc 3 ; SG1, SG2 OUTPUT PULSE VOLTAGE
Vcc 4 ; NV OUTPUT PULSE VOLTAGE


Vcc 3 23
XSG 1 20
XSG 2 17
Vcc 2-1 3
XV 1 19
Vcc 2-2 4
XV 2 18
Vcc 2-3 8
XV 3 16
Vcc 2-4 9
XV 4 15
Vcc 4 13
XNV 14
PS 21
Vcc 1 22
MODE SELECT
1 SG 1
6 SG 2
2 V 1
5 V 2
7 V 3
10 V 4
11 NV

CXA1118M (SONY) FLAT PACKAGE

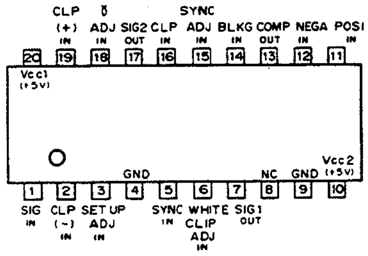
IRIS DRIVER/GAIN CONTROL AMPLIFIER

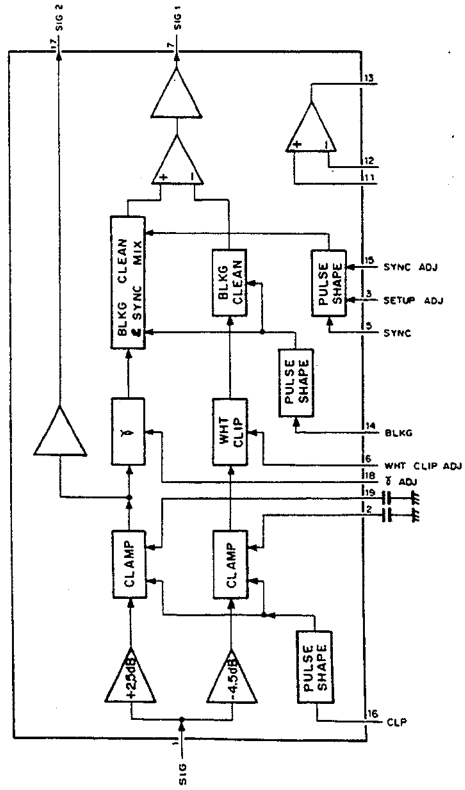

CLP CAP 10
CLP IN 9
AUTO IRIS OUT 8
GAIN LIMIT IN 7
GAIN CONT IN 6
GND
Vcc (+5V)
1 SIG IN
2 CLP CAP
3
4 SIG OUT
5


CLAMP
8 AUTO IRIS
SIG 1
CLAMP
GAIN CONT AMP
4 SIG
PULSE SHAPE
LEVEL SHIFT
9 CLP
10
2
6 GAIN CONT
7 GAIN LIMIT

CXA1119M (SONY) FLAT PACKAGE

VIDEO SIGNAL PROCESSOR

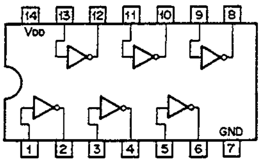

CLP (+) IN 19
γ ADJ IN 18
SIG2 OUT 17
CLP IN 16
SYNC ADJ IN 15
BLKG IN 14
COMP OUT 13
NEGA IN 12
POSI IN 11
20 Vcc1 (+5V)
GND
NC
GND
Vcc2 (+5V)
1 SIG IN
2 CLP (−) IN
3 SET UP ADJ IN
4
5 SYNC IN
6 WHITE CLIP ADJ IN
7 SIG1 OUT
8
9
10

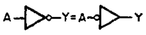

17 SIG 2
7 SIG 1
13
12
11
BLKG CLEAN & SYNC MIX
BLKG CLEAN
PULSE SHAPE
15 SYNC ADJ
3 SETUP ADJ
5 SYNC
PULSE SHAPE
14 BLKG
γ
WHT CLIP
6 WHT CLIP ADJ
18 γ ADJ
19
2
CLAMP
CLAMP
+25dB
-4.5dB
PULSE SHAPE
16 CLP
1 SIG

74AC04SJ (FSC) FLAT PACKAGE

C-MOS HEX INVERTER

— TOP VIEW —


14 13 12 11 10 9 8
VDD
GND
1 2 3 4 5 6 7



Y = $\bar{A}$

A	Y
0	1
1	0

0: LOW LEVEL
1: HIGH LEVEL

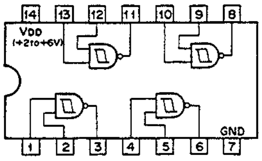
NOTE :

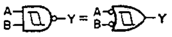
TYPE	VDD
74ACT04 TYPES 74HCT04 TYPES	+5V
OTHER TYPES	+2V to +6V

MC74HC132AF (MOTOROLA) FLAT PACKAGE
MC74HC132F (MOTOROLA) FLAT PACKAGE

C-MOS 2-INPUT NAND SCHMITT TRIGGER

— TOP VIEW —


14 13 12 11 10 9 8
VDD (+2to+6V)
GND
1 2 3 4 5 6 7



Y = $\overline{A \cdot B} = \bar{A} + \bar{B}$

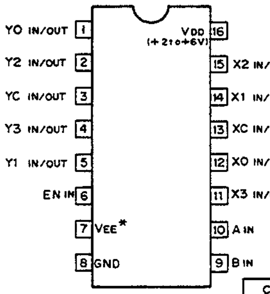
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

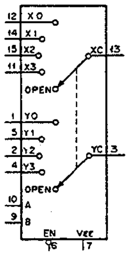
0 ; LOW LEVEL
1 ; HIGH LEVEL

MC74HC4052F (MOTOROLA) FLAT PACKAGE

C-MOS 4-CHANNEL MULTIPLEXER/DEMULTIPLEXER

— TOP VIEW —


Y0 IN/OUT 1
Y2 IN/OUT 2
YC IN/OUT 3
Y3 IN/OUT 4
Y1 IN/OUT 5
EN IN 6
7 VEE*
8 GND
16 VDD (+2to+6V)
15 X2 IN/OUT
14 X1 IN/OUT
13 XC IN/OUT
12 X0 IN/OUT
11 X3 IN/OUT
10 A IN
9 B IN


12 X0
14 X1
15 X2
11 X3
XC 13
OPEN
1 Y0
5 Y1
2 Y2
4 Y3
YC 3
OPEN
10 A
9 B
EN 6
VEE 7

VEE* ; VDD − VEE = +3 to +12V

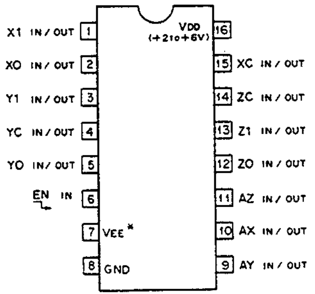
0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE.

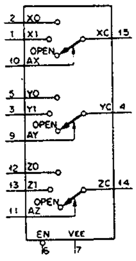
CONTROL INPUTS			"ON" CHANNEL
EN	B	A	
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	X	X	OPEN

MC74HC4053F (MOTOROLA) FLAT PACKAGE

C-MOS 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER

— TOP VIEW —


X1 IN / OUT 1
X0 IN / OUT 2
Y1 IN / OUT 3
YC IN / OUT 4
Y0 IN / OUT 5
EN IN 6
7 VEE*
8 GND
16 VDD (+2to+6V)
15 XC IN / OUT
14 ZC IN / OUT
13 Z1 IN / OUT
12 Z0 IN / OUT
11 AZ IN / OUT
10 AX IN / OUT
9 AY IN / OUT


2 X0
1 X1
XC 15
OPEN
10 AX
5 Y0
3 Y1
YC 4
OPEN
9 AY
12 Z0
13 Z1
ZC 14
OPEN
11 AZ
EN 6
VEE 7

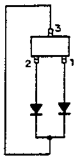
VEE* ; VDD − VEE = +3 to +12V
VEE ≦ GND

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

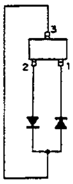
CONT. INPUTS		ON CHANNEL
EN	A (X,Y,Z,)	
0	0	0
0	1	1
1	X	OPEN

Tr,Di

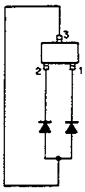
<Diode>



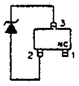
1S2837
1SS304
MA152WK



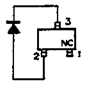
1SS123
1SS226



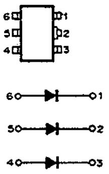
1S2835
1S2836
1SS303



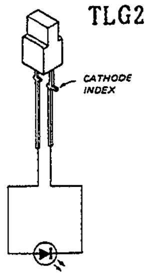
RD18M-B1
RD5.1M-B2



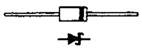
SB05-05CP



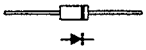
MA121


CATHODE INDEX

TLG208;GREEN

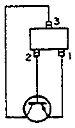


11DQ03

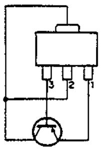


1S1555
1SS119

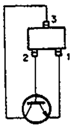
<Transistor>



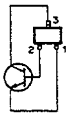
2SA1162
2SA1226
2SA1461
2SA1611
2SA812



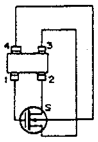
2SB1114
2SB1121



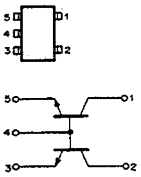
2SC1623
2SC2757
2SC3734
2SC4081
2SC4177



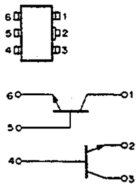
2SC4103



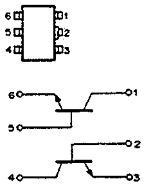
3SK163



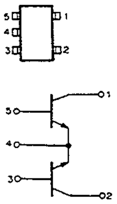
FMW-2



IMX4



IMZ1



FMW-10
FMW-3
FMW-5

SECTION C
REPAIR PARTS

C-1. PARTS INFORMATION

1. **Safety Related Components Warning.**
   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.

2. Replacement Parts supplied from Sony Parts Center will sometimes have a different shape from the original parts. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
   This manual's exploded views and electrical spare parts list indicate the parts numbers of "the standardized genuine parts at present".
   Regarding engineering parts changes in our engineering department, refer to Sony service bulletins and service manual supplements.

3. Items marked "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

4. **Abbreviations**

Ref.No.	Description	Ref.No.	Description
C??,CV??	CAPACITOR	CN??	CONNECTOR
CP??	COMBINATION PARTS	D??	DIODE
DL??	DELAY LINE	F??	FUSE
FL??	FILTER	IC??	IC
L??,LV??	INDUCTOR	M??	MOTOR
ME??	METER	PL??	LAMP
Q??	TRANSISTOR	R??,RV??	RESISTOR
RY??	RELAY	SW??	SWITCH
T??	TRANSFORMER	TH??	THERMISTOR
X??	CRYSTAL		

5. Units for Capacitors, Inductors and Resistors
   The following units are assumed in schematic diagrams and electrical parts list and unless otherwise specified:
   Capacitors: micro farad
   Inductors: micro henry
   Resistors: ohm

C-2. ELECTRICAL PARTS LIST

Notes <E>: For XC-77RR(UCJ)
<C>: For XC-77RR-CE(EK)
<1>: XC-77RR(UCJ) Serial No. 10001 to 10175
XC-77RR-CE(EK) Serial No. 10001 to 10055
<2>: XC-77RR(UCJ) Serial No. 10176 and higher
XC-77RR-CE(EK) Serial No. 10056 and higher
<3>: XC-77RR(UCJ) Exclude serial No. 10176 to 10675
XC-77RR-CE(EK) Exclude serial No. 10056 to 10255
<4>: XC-77RR(UCJ) Serial No. 10176 to 10675
XC-77RR-CE(EK) Serial No. 10056 to 10255

DR-96 Board

Ref No. or Q'ty	Parts No.	Description <Note>
⚠	*A-7515-118-A	COMPLETE PCB, DR-96
1pc	*3-716-242-01	INSULATOR, DC-DC CONVERTER
2pcs	3-884-171-00	STOPPER
	9-911-841-99	CUSHION, RUBBER
C1	1-126-948-11	ELECT 100 20% 35V
C2	1-126-935-11	ELECT 470 20% 16V
C3-5	1-126-925-11	ELECT 470 20% 10V
C6	1-126-916-11	ELECT 1000 20% 6.3V
C7	1-126-925-11	ELECT 470 20% 10V
C8	1-126-935-11	ELECT 470 20% 16V
C9	1-135-166-21	TANTAL. CHIP 47 10% 10V
C10	1-135-161-21	TANTAL. CHIP 22 10% 10V
C11	1-162-927-11	CERAMIC CHIP 100pF 5% 50V
C12	1-135-159-21	TANTAL. CHIP 10 10% 20V
C13	1-164-156-11	CERAMIC CHIP 0.1 25V
C14	1-162-927-11	CERAMIC CHIP 100pF 5% 50V
C15	1-164-156-11	CERAMIC CHIP 0.1 25V
C16	1-135-166-21	TANTAL. CHIP 47 10% 10V
C17	1-164-156-11	CERAMIC CHIP 0.1 25V
C18	1-135-166-21	TANTAL. CHIP 47 10% 10V
C19	1-164-156-11	CERAMIC CHIP 0.1 25V
C20	1-162-927-11	CERAMIC CHIP 100pF 5% 50V
C21, 22	1-164-156-11	CERAMIC CHIP 0.1 25V
C23, 24	1-135-166-21	TANTAL. CHIP 47 10% 10V
C25	1-135-161-21	TANTAL. CHIP 22 10% 10V
C26	1-164-156-11	CERAMIC CHIP 0.1 25V
C28, 29	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C30	1-163-038-00	CERAMIC CHIP 0.1 25V
C31	1-164-156-11	CERAMIC CHIP 0.1 25V
C32	1-135-166-21	TANTAL. CHIP 47 10% 10V
C33	1-164-156-11	CERAMIC CHIP 0.1 25V
C34	1-162-927-11	CERAMIC CHIP 100pF 5% 50V
C36, 37	1-164-156-11	CERAMIC CHIP 0.1 25V
C38	1-135-161-21	TANTAL. CHIP 22 10% 10V
C39	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C40	1-135-165-11	TANTAL. CHIP 33 20% 16V
C41	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-091-00	TANTAL. CHIP 1 10% 16V <2>
C42	1-135-165-11	TANTAL. CHIP 33 20% 16V
C43	1-164-156-11	CERAMIC CHIP 0.1 25V
C44	1-135-138-11	TANTAL. CHIP 10 10% 25V
C45-49	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C50	1-164-156-11	CERAMIC CHIP 0.1 25V
C51	1-135-165-11	TANTAL. CHIP 33 20% 16V
C52	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C53-56	1-135-146-21	TANTAL. CHIP 0.68 10% 25V
C57-62	1-162-919-11	CERAMIC CHIP 22pF 5% 50V
C63, 64	1-164-156-11	CERAMIC CHIP 0.1 25V
C65	1-135-149-21	TANTAL. CHIP 2.2 10% 10V
C66	1-135-166-21	TANTAL. CHIP 47 10% 10V
C67-69	1-164-156-11	CERAMIC CHIP 0.1 25V
C70	1-135-149-21	TANTAL. CHIP 2.2 10% 10V
C72	1-164-156-11	CERAMIC CHIP 0.1 25V
C73	1-102-973-00	CERAMIC 100pF 5% 50V <1>
	1-162-927-11	CERAMIC CHIP 100pF 5% 50V <2>
C74	1-162-927-11	CERAMIC CHIP 100pF 5% 50V <2>
C75, 76	1-163-141-00	CERAMIC CHIP 0.001 5% 50V
CN1, 2	1-569-432-11	SOCKET, MICRO COMPUTER 13P
CN3	1-566-535-11	CONNECTOR, FPC (ZIF) 19P
CN4	1-566-724-11	CONNECTOR, 6P, MALE
CN5	1-566-428-11	CONNECTOR, 4P, MALE
CN6	1-566-426-11	CONNECTOR, 2P, MALE
D1	8-719-200-08	DIODE 11DQ03
D3-7	8-719-400-18	DIODE MA152WK
D8	8-719-800-76	DIODE 1SS226
D9, 10	8-719-938-75	DIODE SB05-05CP
D11-14	8-719-104-34	DIODE 1S2836
D15	8-719-400-18	DIODE MA152WK
D17, 18	8-719-938-75	DIODE SB05-05CP
D19	8-719-107-13	DIODE RD18M-B1
⚠F1	1-532-775-11	FUSE, MICRO 0.8A 125V
IC1	8-759-100-94	IC uPC358G2
IC2, 3	8-759-013-02	IC CXB0026AM
IC4	8-759-985-17	IC 74AC04SJ
IC5	8-752-031-03	IC CXA1065M
IC6	8-759-032-32	IC MC74HC132AF
IC7	8-759-031-84	IC SC7S04F
L1-7	1-410-709-31	INDUCTOR CHIP 22
L8-10	1-410-194-51	INDUCTOR CHIP 1.5
L12, 13	1-410-709-31	INDUCTOR CHIP 22
PU1	1-466-308-11	CONVERTER, DC-DC (CD-116)
Q1	8-729-805-25	TRANSISTOR 2SB1121-S
Q2	8-729-117-32	TRANSISTOR 2SC4177
Q3	8-729-122-63	TRANSISTOR 2SA1226
Q4	8-729-117-16	TRANSISTOR 2SA1611-M6
Q5	8-729-122-63	TRANSISTOR 2SA1226
Q6	8-729-926-19	TRANSISTOR 2SC4103-Q
Q7	8-729-117-32	TRANSISTOR 2SC4177
Q8	8-729-140-32	TRANSISTOR 2SA1461-Y24
Q9	8-729-140-37	TRANSISTOR 2SC3734-L-B24
Q10	8-729-926-19	TRANSISTOR 2SC4103-Q
Q11	8-729-117-32	TRANSISTOR 2SC4177
Q12	8-729-117-16	TRANSISTOR 2SA1611-M6
Q13	8-729-117-32	TRANSISTOR 2SC4177
Q14	8-729-907-46	TRANSISTOR IMZ1
Q15	8-729-926-22	TRANSISTOR FMW-3
Q16	8-729-117-32	TRANSISTOR 2SC4177

(DR-96 Board)

Ref No.	Parts No.	Description	<Note>
R2	1-216-840-11	METAL CHIP 39K 5% 1/16W	
R3	1-216-841-11	METAL CHIP 47K 5% 1/16W	
R4	1-216-022-00	METAL CHIP 75 5% 1/10W	
R5	1-216-829-11	METAL CHIP 4.7K 5% 1/16W	
R6	1-216-022-00	METAL CHIP 75 5% 1/10W	
R7	1-216-821-11	METAL CHIP 1K 5% 1/16W	
R8	1-216-844-11	METAL CHIP 82K 5% 1/16W	
R9	1-216-839-11	METAL CHIP 33K 5% 1/16W	
R10	1-216-829-11	METAL CHIP 4.7K 5% 1/16W	
R11	1-216-843-11	METAL CHIP 68K 5% 1/16W	
R12	1-216-848-11	METAL CHIP 180K 5% 1/16W	
R13	1-216-833-11	METAL CHIP 10K 5% 1/16W	
R14	1-216-864-11	METAL CHIP 0 5% 1/16W	
R15	1-216-845-11	METAL CHIP 100K 5% 1/16W	
R16	1-216-821-11	METAL CHIP 1K 5% 1/16W	
R17	1-216-631-11	METAL CHIP 150 0.5% 1/10W	
R18	1-216-845-11	METAL CHIP 100K 5% 1/16W	
R19	1-216-821-11	METAL CHIP 1K 5% 1/16W	
R20	1-216-631-11	METAL CHIP 150 0.5% 1/10W	<2>
R21	1-216-821-11	METAL CHIP 1K 5% 1/16W	
R22, 23	1-216-845-11	METAL CHIP 100K 5% 1/16W	
R24	1-216-837-11	METAL CHIP 22K 5% 1/16W	
R25	1-216-845-11	METAL CHIP 100K 5% 1/16W	
R26	1-216-823-11	METAL CHIP 1.5K 5% 1/16W	
R28, 29	1-216-789-11	METAL CHIP 2.2 5% 1/16W	
R30	1-216-830-11	METAL CHIP 5.6K 5% 1/16W	
R31	1-216-021-00	METAL CHIP 68 5% 1/10W	
R32	1-216-830-11	METAL CHIP 5.6K 5% 1/16W	
R33	1-216-846-11	METAL CHIP 120K 5% 1/16W	
R34	1-216-838-11	METAL CHIP 27K 5% 1/16W	
R35	1-216-842-11	METAL CHIP 56K 5% 1/16W	
R36	1-216-835-11	METAL CHIP 15K 5% 1/16W	
R37	1-216-851-11	METAL CHIP 330K 5% 1/16W	
R38	1-216-841-11	METAL CHIP 47K 5% 1/16W	
R39	1-216-839-11	METAL CHIP 33K 5% 1/16W	
R40-43	1-216-853-11	METAL CHIP 470K 5% 1/16W	
R44	1-216-839-11	METAL CHIP 33K 5% 1/16W	
R45	1-216-833-11	METAL CHIP 10K 5% 1/16W	
R46	1-216-631-11	METAL CHIP 150 0.5% 1/10W	<1>
	1-216-627-11	METAL CHIP 100 0.5% 1/10W	<2>
R49	1-216-025-00	METAL CHIP 100 5% 1/10W	
R50	1-216-627-11	METAL CHIP 100 0.5% 1/10W	
R51, 52	1-216-841-11	METAL CHIP 47K 5% 1/16W	
R53	1-216-022-00	METAL CHIP 75 5% 1/10W	
R54	1-216-864-11	METAL CHIP 0 5% 1/16W	
R56	1-216-821-11	METAL CHIP 1K 5% 1/16W	
R57-60	1-216-809-11	METAL CHIP 100 5% 1/16W	
R61	1-216-835-11	METAL CHIP 15K 5% 1/16W	
R62	1-216-025-00	METAL CHIP 100 5% 1/10W	<1>
R66	1-216-049-00	METAL CHIP 1K 5% 1/10W	
RV1	1-230-870-11	ADJ, METAL 10K	
RV2	1-230-874-11	ADJ, METAL 100K	
SW1, 2	1-571-120-11	SWITCH, SLIDE	
SW3	1-571-975-11	SWITCH, SLIDE	
SW4, 5	1-571-120-11	SWITCH, SLIDE	
SW6	1-571-249-11	SWITCH, SLIDE	

FL-108 Board

Ref No. or Q'ty	Parts No.	Description <Note>
1pc	*1-634-924-11	PC BOARD, FL-108
C1	1-163-115-00	CERAMIC CHIP 82pF 5% 50V
L1	1-410-995-31	INDUCTOR CHIP 1.5

HN-134 Board

Ref No. or Q'ty	Parts No.	Description <Note>
1pc	1-633-852-11	PC BOARD, HN-134
CN1	1-569-434-11	HEADER, MICRO COMPUTER 5P
CN2	1-569-427-11	HEADER, MICRO COMPUTER 3P
CN3	1-569-433-11	HEADER, MICRO COMPUTER 4P
CN4	1-569-433-11	HEADER, MICRO COMPUTER 4P
CN5	1-569-431-11	SOCKET, MICRO COMPUTER 5P
CN6	1-569-430-11	SOCKET, MICRO COMPUTER 4P
CN7	1-569-430-11	SOCKET, MICRO COMPUTER 4P

PA-93 Board

Ref No.	Parts No.	Description <Note>
	*A-7520-483-A	COMPLETE PCB, PA-93
C1	1-135-160-21	TANTAL. CHIP 15 10% 16V
C2	1-164-156-11	CERAMIC CHIP 0.1 25V
C3	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C4	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C5	1-164-156-11	CERAMIC CHIP 0.1 25V
C6	1-135-152-21	TANTAL. CHIP 1.5 10% 35V
C7	1-162-970-11	CERAMIC CHIP 0.01 10% 25V
C8	1-162-964-11	CERAMIC CHIP 0.001 10% 50V
C9	1-163-077-00	CERAMIC CHIP 0.1 50V
C10	1-135-224-11	TANTAL. CHIP 10 10% 25V
C11	1-135-085-21	TANTAL. CHIP 4.7 10% 25V
C12	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C13	1-162-965-11	CERAMIC CHIP 1500pF 10% 50V
C14	1-164-156-11	CERAMIC CHIP 0.1 25V
C15	1-135-225-11	TANTAL. CHIP 33 10% 16V
C17	1-135-149-21	TANTAL. CHIP 2.2 10% 10V
C18	1-135-156-21	TANTAL. CHIP 6.8 10% 10V
C19	1-135-160-21	TANTAL. CHIP 15 10% 16V
C20	1-164-156-11	CERAMIC CHIP 0.1 25V
C21	1-164-156-11	CERAMIC CHIP 0.1 25V
C22	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-208-11	TANTAL. CHIP 1 20% 10V <2>
C23	1-164-156-11	CERAMIC CHIP 0.1 25V
C26	1-135-157-21	TANTAL. CHIP 10 10% 6.3V
C27	1-135-225-11	TANTAL. CHIP 33 10% 16V
C28	1-135-225-11	TANTAL. CHIP 33 10% 16V
D1	8-719-123-85	DIODE 1SS304
D2	8-719-123-85	DIODE 1SS304
D3	8-719-123-85	DIODE 1SS304
D4	8-719-123-85	DIODE 1SS304
D5	8-719-938-75	DIODE SB05-05CP
D6	8-719-123-82	DIODE 1SS303 <2>
D7	8-719-123-82	DIODE 1SS303 <2>
D8	8-719-911-19	DIODE 1SS119 <1>
D9	8-719-911-19	DIODE 1SS119 <1>
D10	8-719-911-19	DIODE 1SS119 <1>
D11	8-719-911-19	DIODE 1SS119 <1>
Q1	8-729-122-63	TRANSISTOR 2SA1226
Q2	8-729-122-63	TRANSISTOR 2SA1226
Q3	8-729-175-73	TRANSISTOR 2SC2757
Q4	8-729-117-32	TRANSISTOR 2SC4177
Q5	8-729-117-16	TRANSISTOR 2SA1611-M6
Q6	8-729-117-16	TRANSISTOR 2SA1611-M6
Q7	8-729-117-32	TRANSISTOR 2SC4177
Q8	8-729-926-19	TRANSISTOR 2SC4103-Q
Q9	8-729-926-19	TRANSISTOR 2SC4103-Q
Q10	8-729-926-27	TRANSISTOR FMW-10
Q11	8-729-175-73	TRANSISTOR 2SC2757
Q12	8-729-175-73	TRANSISTOR 2SC2757
Q13	8-729-122-63	TRANSISTOR 2SA1226
Q14	8-729-175-73	TRANSISTOR 2SC2757
Q15	8-729-122-63	TRANSISTOR 2SA1226
Q16	8-729-117-16	TRANSISTOR 2SA1611-M6
R1	1-216-029-00	METAL CHIP 150 5% 1/10W
R2	1-216-840-11	METAL CHIP 39K 5% 1/16W
R3	1-216-833-11	METAL CHIP 10K 5% 1/16W
R4	1-216-821-11	METAL CHIP 1K 5% 1/16W
R5	1-216-029-00	METAL CHIP 150 5% 1/10W
R6	1-216-029-00	METAL CHIP 150 5% 1/10W
R7	1-216-839-11	METAL CHIP 33K 5% 1/16W
R9	1-216-837-11	METAL CHIP 22K 5% 1/16W
R10	1-216-797-11	METAL CHIP 10 5% 1/16W
R11	1-216-857-11	METAL CHIP 1M 5% 1/16W
R13	1-216-843-11	METAL CHIP 68K 5% 1/16W
R14	1-216-834-11	METAL CHIP 12K 5% 1/16W
R15	1-216-827-11	METAL CHIP 3.3K 5% 1/16W
R16	1-216-837-11	METAL CHIP 22K 5% 1/16W
R17	1-216-837-11	METAL CHIP 22K 5% 1/16W
R18	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R19	1-216-865-11	METAL CHIP 3K 5% 1/16W
R20	1-216-993-11	METAL CHIP 2.4K 5% 1/16W
R21	1-216-993-11	METAL CHIP 2.4K 5% 1/16W
R22	1-216-821-11	METAL CHIP 1K 5% 1/16W
R23	1-216-838-11	METAL CHIP 27K 5% 1/16W
R24	1-216-837-11	METAL CHIP 22K 5% 1/16W
R25	1-216-821-11	METAL CHIP 1K 5% 1/16W
R26	1-216-298-00	METAL CHIP 2.2 5% 1/10W
R27	1-216-021-00	METAL CHIP 68 5% 1/10W
R28	1-216-822-11	METAL CHIP 1.2K 5% 1/16W
R29	1-216-821-11	METAL CHIP 1K 5% 1/16W
R31	1-216-837-11	METAL CHIP 22K 5% 1/16W
R32	1-216-029-00	METAL CHIP 150 5% 1/10W
R33	1-216-298-00	METAL CHIP 2.2 5% 1/10W
R35	1-216-077-00	METAL CHIP 15K 5% 1/10W <1>
	1-216-835-11	METAL CHIP 15K 5% 1/16W <2>
R36	1-216-822-11	METAL CHIP 1.2K 5% 1/16W

PR-133 Board

Ref No.	Parts No.	Description <Note>
	*A-7515-119-A	COMPLETE PCB, PR-133 <E>
	*A-7515-122-A	COMPLETE PCB, PR-133P <C>
	9-911-845-99	CUSHION, METER
C1	1-126-925-11	ELECT 470 20% 10V
C2, 4	1-135-161-21	TANTAL. CHIP 22 10% 10V
C5	1-161-051-00	CERAMIC 0.01 10% 50V <1>
	1-164-232-11	CERAMIC CHIP 0.01 10% 100V <2>
C6	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-208-11	TANTAL. CHIP 1 20% 10V <2>
C10	1-164-156-11	CERAMIC CHIP 0.1 25V
C11	1-135-161-21	TANTAL. CHIP 22 10% 10V
C12, 13	1-135-165-21	TANTAL. CHIP 33 10% 16V
C14	1-164-156-11	CERAMIC CHIP 0.1 25V
C15	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C16, 17	1-164-156-11	CERAMIC CHIP 0.1 25V
C18	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C19, 20	1-164-156-11	CERAMIC CHIP 0.1 25V
C21	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C22	1-164-156-11	CERAMIC CHIP 0.1 25V
C23	1-131-368-00	TANTALUM 3.3 10% 16V <1>
	1-135-180-21	TANTAL. CHIP 3.3 10% 10V <2>
C24	1-164-156-11	CERAMIC CHIP 0.1 25V
C25	1-135-165-21	TANTAL. CHIP 33 10% 16V
C26	1-164-156-11	CERAMIC CHIP 0.1 25V
C27, 28	1-135-162-21	TANTAL. CHIP 33 10% 6.3V
C29	1-135-160-21	TANTAL. CHIP 15 10% 16V
C30	1-162-908-11	CERAMIC CHIP 3pF 50V
C31, 32	1-164-156-11	CERAMIC CHIP 0.1 25V
C33	1-135-166-21	TANTAL. CHIP 47 10% 10V
C34	1-164-156-11	CERAMIC CHIP 0.1 25V
C35	1-135-148-21	TANTAL. CHIP 1.5 10% 16V
C36	1-135-161-21	TANTAL. CHIP 22 10% 10V
C37	1-135-097-21	TANTAL. CHIP 15 10% 10V
C38-41	1-164-156-11	CERAMIC CHIP 0.1 25V
C42	1-135-166-21	TANTAL. CHIP 47 10% 10V
C43	1-163-036-00	CERAMIC CHIP 0.068 50V
C44, 45	1-164-156-11	CERAMIC CHIP 0.1 25V
C46	1-163-036-00	CERAMIC CHIP 0.068 50V
C47	1-135-155-21	TANTAL. CHIP 4.7 10% 16V
C48-50	1-164-156-11	CERAMIC CHIP 0.1 25V
C51	1-135-097-21	TANTAL. CHIP 15 10% 10V
C52	1-126-245-11	ELECT 330 20% 6.3V
C53	1-135-166-21	TANTAL. CHIP 47 10% 10V
C54, 55	1-164-156-11	CERAMIC CHIP 0.1 25V
C56, 57	1-162-908-11	CERAMIC CHIP 3pF 50V
C58-60	1-135-166-21	TANTAL. CHIP 47 10% 10V
C61	1-164-156-11	CERAMIC CHIP 0.1 25V
C62	1-162-915-11	CERAMIC CHIP 10pF 50V
C63	1-135-161-21	TANTAL. CHIP 22 10% 10V
C64	1-164-156-11	CERAMIC CHIP 0.1 25V
C65	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-208-11	TANTAL. CHIP 1 20% 10V <2>
C66	1-164-156-11	CERAMIC CHIP 0.1 25V
C67	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-208-11	TANTAL. CHIP 1 20% 10V <2>
C68	1-135-161-21	TANTAL. CHIP 22 10% 10V
C69, 70	1-164-156-11	CERAMIC CHIP 0.1 25V
C71	1-131-347-00	TANTALUM 1 10% 35V <1>
	1-135-208-11	TANTAL. CHIP 1 20% 10V <2>

(PR-133 Board)

Ref No.	Parts No.	Description <Note>
C72, 73	1-162-927-11	CERAMIC CHIP 100pF 5% 50V
C74	1-164-156-11	CERAMIC CHIP 0.1 25V
C75	1-162-921-11	CERAMIC CHIP 33pF 5% 50V
C76-79	1-164-156-11	CERAMIC CHIP 0.1 25V <1>
C80, 81	1-131-347-00	TANTALUM 1 10% 35V <2>
C82	1-164-156-11	CERAMIC CHIP 0.1 25V
C83, 85	1-135-161-21	TANTAL. CHIP 22 10% 10V
C86	1-135-165-21	TANTAL. CHIP 33 10% 16V
C87	1-164-156-11	CERAMIC CHIP 0.1 25V
C88	1-135-160-21	TANTAL. CHIP 15 10% 16V
C89-92	1-164-156-11	CERAMIC CHIP 0.1 25V
C93	1-162-919-11	CERAMIC CHIP 22pF 5% 50V
C94	1-135-190-21	TANTAL. CHIP 0.1 20% 20V <2>
C95, 97	1-164-156-11	CERAMIC CHIP 0.1 25V
C99-101	1-164-005-11	CERAMIC CHIP 0.47 25V
CN1	1-569-434-11	HEADER, MICRO COMPUTER 5P
CN2, 3	1-569-433-11	HEADER, MICRO COMPUTER 4P
CN4	1-566-724-11	CONNECTOR, 6P, MALE
CN5	1-566-426-11	CONNECTOR, 2P, MALE
D1-4	8-719-123-85	DIODE 1SS304
D5, 6	8-719-400-18	DIODE MA152WK
D7	8-719-123-85	DIODE 1SS304
FL1	1-236-183-11	FILTER, TRAP
IC1	8-752-031-14	IC CXA1118M
IC2	8-752-031-15	IC CXA1119M
IC3	8-759-032-11	IC MC74HC04AF
IC4	8-759-011-64	IC MC74HC4052F
IC5	8-759-011-65	IC MC74HC4053F
L1	1-410-194-51	INDUCTOR CHIP 1.5
Q1	8-729-921-67	TRANSISTOR IMX4
Q2	8-729-903-82	TRANSISTOR FMW2
Q3	8-729-926-19	TRANSISTOR 2SC4103-Q
Q4	8-729-117-16	TRANSISTOR 2SA1611-M6
Q5	8-765-930-08	TRANSISTOR 3SK163-2
Q6	8-729-117-32	TRANSISTOR 2SC4177
Q7	8-729-117-16	TRANSISTOR 2SA1611-M6
Q8	8-765-930-08	TRANSISTOR 3SK163-2
Q9	8-729-117-32	TRANSISTOR 2SC4177
Q10	8-729-117-16	TRANSISTOR 2SA1611-M6
Q11	8-765-930-08	TRANSISTOR 3SK163-2
Q12	8-729-117-32	TRANSISTOR 2SC4177
Q13	8-729-921-67	TRANSISTOR IMX4
Q14	8-729-903-82	TRANSISTOR FMW2
Q15	8-729-122-63	TRANSISTOR 2SA1226
Q16	8-729-926-27	TRANSISTOR FMW-10
Q17	8-729-907-46	TRANSISTOR IMZ1
Q18	8-729-117-32	TRANSISTOR 2SC4177
Q19	8-729-926-27	TRANSISTOR FMW-10
Q20, 21	8-729-117-16	TRANSISTOR 2SA1611-M6
Q22	8-729-926-27	TRANSISTOR FMW-10
Q23	8-729-926-23	TRANSISTOR FMW-5
Q24, 25	8-729-117-16	TRANSISTOR 2SA1611-M6
Q26	8-729-905-35	TRANSISTOR 2SC4081-R
Q27	8-729-926-27	TRANSISTOR FMW-10

(PR-133 Board)

Ref No.	Parts No.	Description <Note>
Q28	8-729-122-63	TRANSISTOR 2SA1226
Q29	8-729-175-73	TRANSISTOR 2SC2757
Q30	8-729-122-63	TRANSISTOR 2SA1226
Q31	8-729-175-73	TRANSISTOR 2SC2757
Q32, 33	8-729-122-63	TRANSISTOR 2SA1226
Q34	8-729-926-27	TRANSISTOR FMW-10
Q35	8-729-117-16	TRANSISTOR 2SA1611-M6
Q36	8-729-926-27	TRANSISTOR FMW-10
Q37, 38	8-729-122-63	TRANSISTOR 2SA1226
Q39	8-729-926-19	TRANSISTOR 2SC4103-Q
Q40	8-729-117-32	TRANSISTOR 2SC4177
Q41	8-729-122-63	TRANSISTOR 2SA1226
Q42	8-729-175-73	TRANSISTOR 2SC2757
Q43	8-729-117-32	TRANSISTOR 2SC4177
Q44	8-729-117-16	TRANSISTOR 2SA1611-M6
Q45	8-729-122-63	TRANSISTOR 2SA1226
Q46-48	8-729-117-16	TRANSISTOR 2SA1611-M6
Q49	8-765-930-08	TRANSISTOR 3SK163-2
Q50	8-729-119-76	TRANSISTOR 2SA1175-HEF <1>
	8-729-117-16	TRANSISTOR 2SA1611-M6 <2>
R1	1-216-797-11	METAL CHIP 10 5% 1/16W
R2	1-216-022-00	METAL CHIP 75 5% 1/10W
R3, 4	1-216-833-11	METAL CHIP 10K 5% 1/16W
R5, 6	1-216-643-11	METAL CHIP 470 0.5% 1/10W
R7	1-216-643-11	METAL CHIP 470 0.5% 1/10W <E>
	1-216-642-11	METAL CHIP 430 0.5% 1/10W <C>
R9, 10	1-216-814-11	METAL CHIP 270 5% 1/16W
R11	1-216-049-00	METAL CHIP 1K 5% 1/10W
R12, 13	1-216-840-11	METAL CHIP 39K 5% 1/16W
R14, 15	1-216-845-11	METAL CHIP 100K 5% 1/16W
R16	1-216-839-11	METAL CHIP 33K 5% 1/16W
R17	1-216-838-11	METAL CHIP 27K 5% 1/16W
R18	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R19	1-216-835-11	METAL CHIP 15K 5% 1/16W
R20	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R21	1-216-835-11	METAL CHIP 15K 5% 1/16W
R22	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R23	1-216-835-11	METAL CHIP 15K 5% 1/16W
R24	1-216-644-11	METAL CHIP 510 0.5% 1/10W
R25	1-216-864-11	METAL CHIP 0 5% 1/16W
R26	1-216-631-11	METAL CHIP 150 0.5% 1/10W
R27, 28	1-216-809-11	METAL CHIP 100 5% 1/16W
R29	1-216-679-11	METAL CHIP 15K 0.5% 1/10W
R30	1-216-659-11	METAL CHIP 2.2K 0.5% 1/10W
R31	1-216-864-11	METAL CHIP 0 5% 1/16W
R32	1-216-073-00	METAL CHIP 10K 5% 1/10W
R33	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R34	1-216-825-11	METAL CHIP 2.2K 5% 1/16W
R35	1-216-643-11	METAL CHIP 470 0.5% 1/10W
R36	1-216-821-11	METAL CHIP 1K 5% 1/16W
R37	1-216-830-11	METAL CHIP 5.6K 5% 1/16W
R38	1-216-669-11	METAL CHIP 5.6K 0.5% 1/10W
R39	1-216-660-11	METAL CHIP 2.4K 0.5% 1/10W
R40	1-216-825-11	METAL CHIP 2.2K 5% 1/16W
R41	1-216-821-11	METAL CHIP 1K 5% 1/16W
R42	1-216-831-11	METAL CHIP 6.8K 5% 1/16W
R43	1-216-837-11	METAL CHIP 22K 5% 1/16W
R44	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R45	1-216-839-11	METAL CHIP 33K 5% 1/16W
R46	1-216-825-11	METAL CHIP 2.2K 5% 1/16W
R47	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R48	1-216-689-11	METAL CHIP 39K 0.5% 1/10W
R49	1-216-671-11	METAL CHIP 6.8K 0.5% 1/10W
R50	1-216-687-11	METAL CHIP 33K 0.5% 1/10W
R51	1-216-680-11	METAL CHIP 16K 0.5% 1/10W
R52	1-216-821-11	METAL CHIP 1K 5% 1/16W
R53	1-216-840-11	METAL CHIP 39K 5% 1/16W
R54	1-216-818-11	METAL CHIP 560 5% 1/16W
R55	1-216-827-11	METAL CHIP 3.3K 5% 1/16W
R56, 57	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R58	1-216-827-11	METAL CHIP 3.3K 5% 1/16W
R59	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R60	1-216-857-11	METAL CHIP 1M 5% 1/16W
R61, 62	1-216-833-11	METAL CHIP 10K 5% 1/16W
R63	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R64-66	1-216-827-11	METAL CHIP 3.3K 5% 1/16W
R67	1-216-836-11	METAL CHIP 18K 5% 1/16W
R68	1-216-837-11	METAL CHIP 22K 5% 1/16W
R69	1-216-835-11	METAL CHIP 15K 5% 1/16W
R70	1-216-834-11	METAL CHIP 12K 5% 1/16W
R71, 72	1-216-836-11	METAL CHIP 18K 5% 1/16W
R73, 74	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R75	1-216-824-11	METAL CHIP 1.8K 5% 1/16W
R76	1-216-826-11	METAL CHIP 2.7K 5% 1/16W
R77	1-216-824-11	METAL CHIP 1.8K 5% 1/16W
R78	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R79	1-216-789-11	METAL CHIP 2.2 5% 1/16W
R80	1-216-022-00	METAL CHIP 75 5% 1/10W
R81	1-216-049-00	METAL CHIP 1K 5% 1/10W
R82	1-216-853-11	METAL CHIP 470K 5% 1/16W
R83	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R84	1-216-663-11	METAL CHIP 3.3K 0.5% 1/10W
R85	1-216-659-11	METAL CHIP 2.2K 0.5% 1/10W
R86, 87	1-216-815-11	METAL CHIP 330 5% 1/16W
R88, 89	1-216-639-11	METAL CHIP 330 0.5% 1/10W
R90	1-216-623-11	METAL CHIP 68 0.5% 1/10W
R91	1-216-659-11	METAL CHIP 2.2K 0.5% 1/10W
R92	1-216-643-11	METAL CHIP 470 0.5% 1/10W <2>
R93	1-216-617-11	METAL CHIP 39 0.5% 1/10W
R94	1-216-833-11	METAL CHIP 10K 5% 1/16W
R95, 96	1-216-837-11	METAL CHIP 22K 5% 1/16W
R97	1-216-835-11	METAL CHIP 15K 5% 1/16W
R98	1-216-837-11	METAL CHIP 22K 5% 1/16W
R99	1-216-834-11	METAL CHIP 12K 5% 1/16W
R100	1-216-837-11	METAL CHIP 22K 5% 1/16W
R101	1-216-834-11	METAL CHIP 12K 5% 1/16W
R102	1-216-838-11	METAL CHIP 27K 5% 1/16W
R103	1-216-686-11	METAL CHIP 30K 0.5% 1/10W
R104	1-216-687-11	METAL CHIP 33K 0.5% 1/10W
R105	1-216-836-11	METAL CHIP 18K 5% 1/16W
R106	1-216-835-11	METAL CHIP 15K 5% 1/16W
R107	1-216-836-11	METAL CHIP 18K 5% 1/16W
R108	1-216-835-11	METAL CHIP 15K 5% 1/16W
R109	1-216-789-11	METAL CHIP 2.2 5% 1/16W
R110	1-216-821-11	METAL CHIP 1K 5% 1/16W
R111, 112	1-216-809-11	METAL CHIP 100 5% 1/16W
R113	1-216-806-11	METAL CHIP 56 5% 1/16W
R114	1-216-821-11	METAL CHIP 1K 5% 1/16W
R115	1-216-660-11	METAL CHIP 2.4K 0.5% 1/10W <E>
	1-216-661-11	METAL CHIP 2.7K 0.5% 1/10W <C>
R116	1-216-663-11	METAL CHIP 3.3K 0.5% 1/10W
R117	1-216-806-11	METAL CHIP 56 5% 1/16W

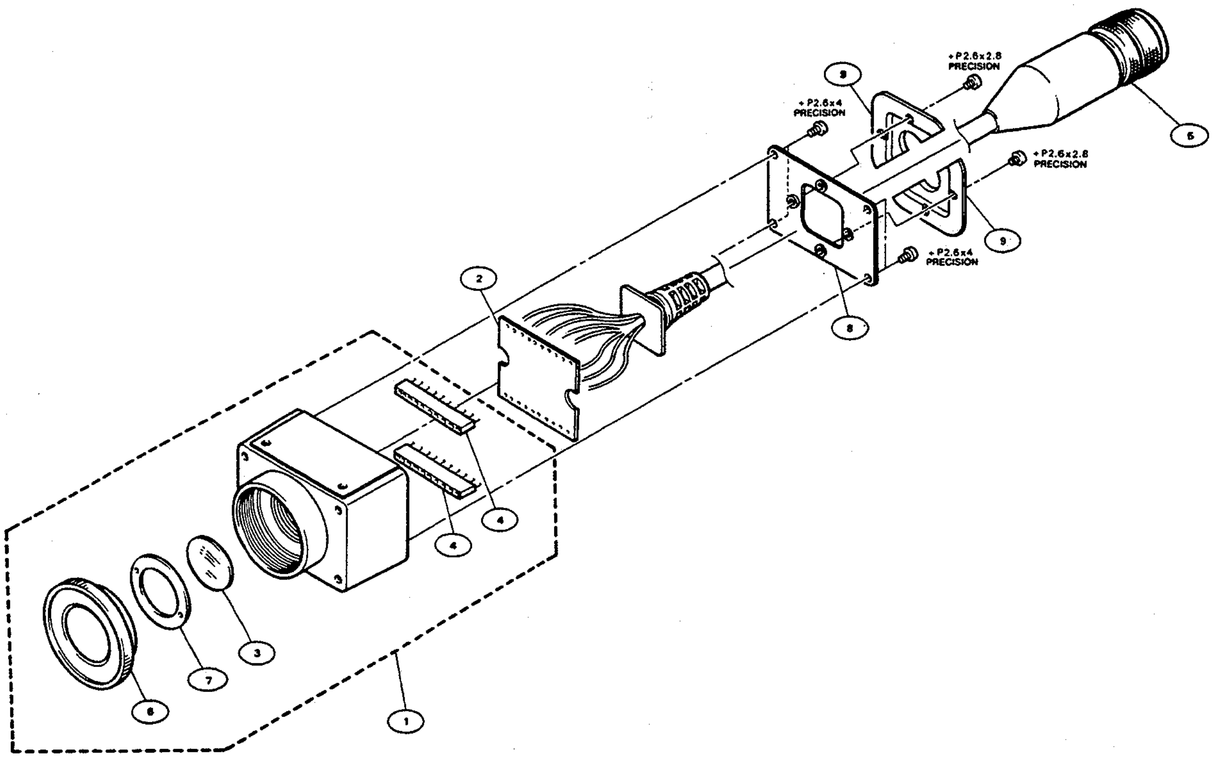
(PR-133 Board)

Ref No.	Parts No.	Description <Note>
R118	1-216-839-11	METAL CHIP 33K 5% 1/16W
R119	1-216-668-11	METAL CHIP 5.1K 0.5% 1/10W
R120	1-216-661-11	METAL CHIP 2.7K 0.5% 1/10W
R121	1-131-341-00	CAP, TANTALUM 0.1 10% 35V <1>
	1-216-623-11	METAL CHIP 68 0.5% 1/10W <2>
R122	1-216-836-11	METAL CHIP 18K 5% 1/16W
R123	1-216-837-11	METAL CHIP 22K 5% 1/16W
R124, 125	1-216-836-11	METAL CHIP 18K 5% 1/16W
R126	1-216-835-11	METAL CHIP 15K 5% 1/16W
R127	1-216-834-11	METAL CHIP 12K 5% 1/16W
R128	1-216-825-11	METAL CHIP 2.2K 5% 1/16W
R129	1-216-821-11	METAL CHIP 1K 5% 1/16W
R130	1-216-864-11	METAL CHIP 0 5% 1/16W
R131	1-216-829-11	METAL CHIP 4.7K 5% 1/16W
R132	1-216-823-11	METAL CHIP 1.5K 5% 1/16W
R133	1-216-864-11	METAL CHIP 0 5% 1/16W
R134	1-216-812-11	METAL CHIP 180 5% 1/16W <1>
	1-216-031-11	METAL CHIP 180 5% 1/10W <2>
R135	1-215-429-00	METAL 2.2K 1% 1/6W <1>
	1-216-659-11	METAL CHIP 2.2K 0.5% 1/10W <2>
R136	1-215-413-00	METAL 470 1% 1/6W <1>
R137	1-216-623-11	METAL CHIP 68 0.5% 1/10W <1>
RV1	1-237-035-11	ADJ, METAL 5K
RV2	1-230-871-11	ADJ, METAL 22K
RV3	1-230-870-11	ADJ, METAL 10K
RV4, 5	1-230-869-11	ADJ, METAL 4.7K
RV6	1-237-033-11	ADJ, METAL 1K
RV7-9	1-230-869-11	ADJ, METAL 4.7K
RV11, 12	1-230-869-11	ADJ, METAL 4.7K
RV13	1-237-033-11	ADJ, METAL 1K
RV15	1-230-870-11	ADJ, METAL 10K
RV16, 17	1-230-869-11	ADJ, METAL 4.7K
RV18	1-230-867-11	ADJ, METAL 1K
SW1	1-571-120-11	SWITCH, SLIDE

C-3. EXPLODED VIEW

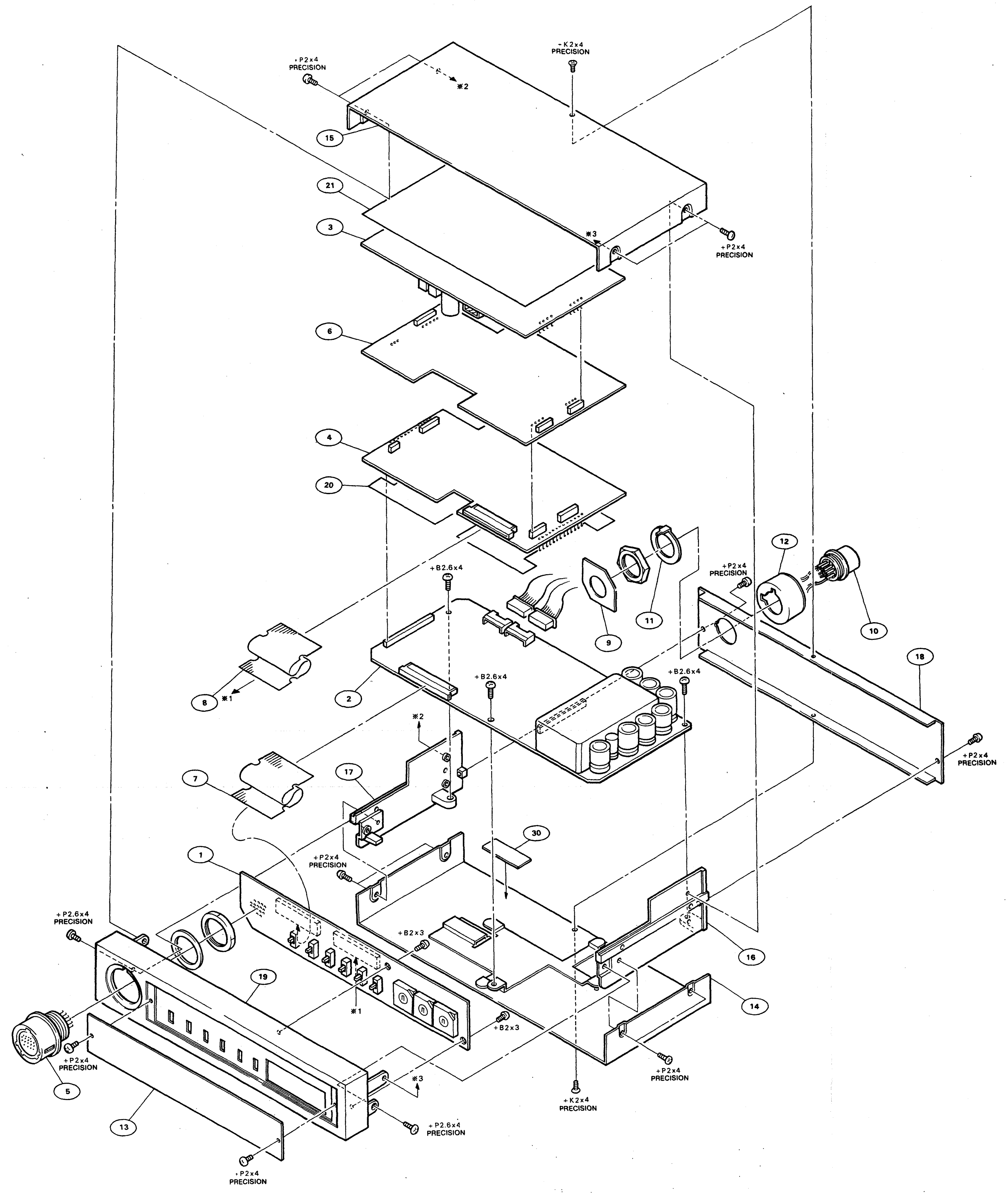
Camera Head Unit

No.	Parts No.	Description <Note>
1	A-7420-185-A	PANEL ASSY, FRONT, CHU <E>
	A-7420-186-A	PANEL ASSY, FRONT, CHU <C>
2	*A-7520-483-A	COMPLETE PCB, PA-93
3	1-235-996-11	FILTER, LOW PASS
4	1-540-134-11	SOCKET, IC (10P)
5	1-575-549-12	CABLE ASSY, CAMERA (15-CORE)
6	2-042-385-00	CAP, C MOUNT
7	*3-683-260-01	RING, RETAINER
8	*3-718-853-01	PANEL, REAR, CHU
9	3-718-854-01	HOUSING, CABLE
	7-627-556-08	SCREW, PRECISION +P 2.6x2.8
	7-627-556-38	SCREW, PRECISION +P 2.6x4.0


+P2.6x2.8 PRECISION
9
+P2.6x4 PRECISION
5
+P2.6x2.8 PRECISION
9
+P2.6x4 PRECISION
8
2
4
4
3
7
6
1

Camera Control Unit

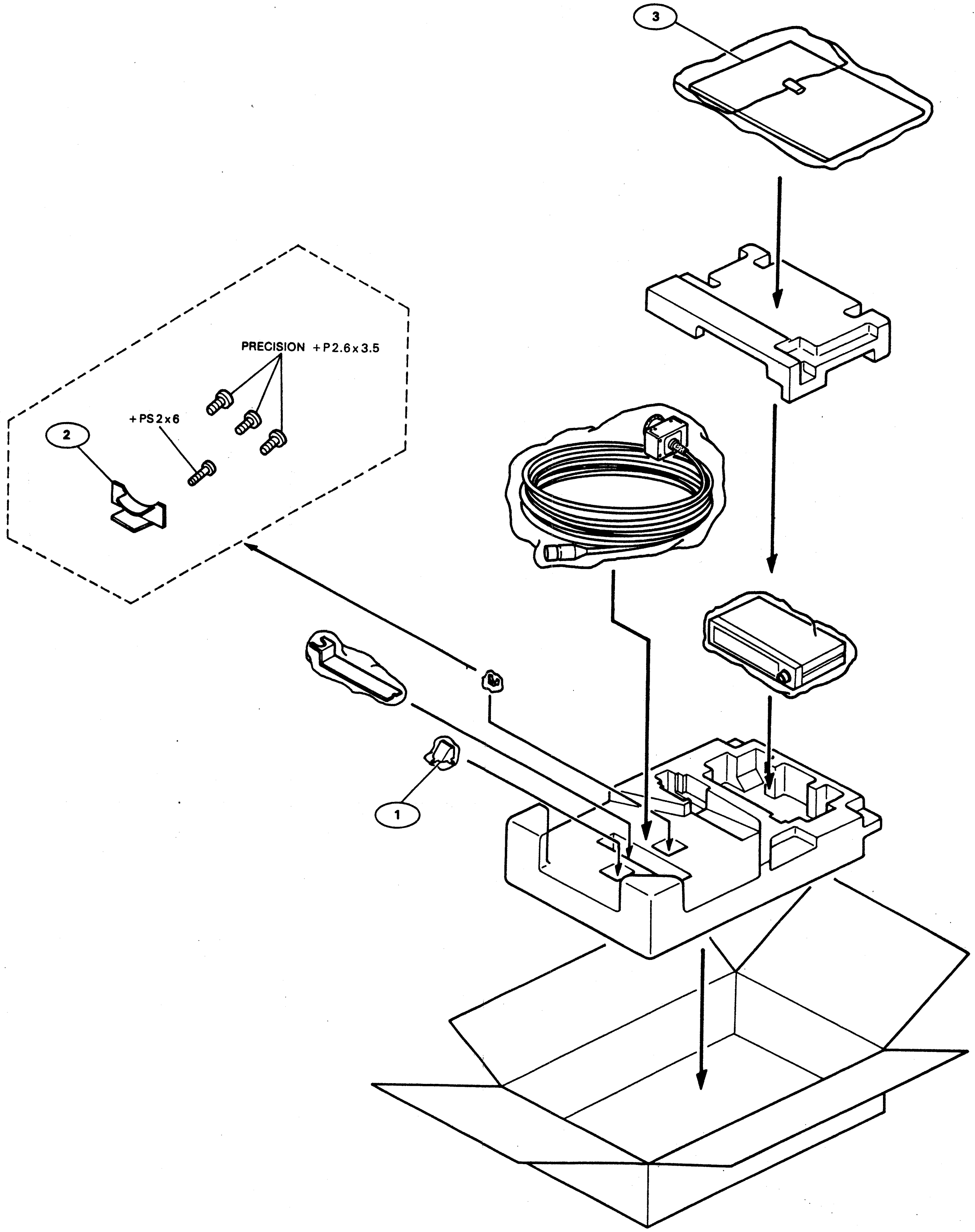
No.	Parts No.	Description <Note>
1	*A-7515-117-A	COMPLETE PCB, SW-367 <E>
	*A-7515-123-A	COMPLETE PCB, SW-367P <C>
⚠2	*A-7515-118-A	COMPLETE PCB, DR-96
3	*A-7515-119-A	COMPLETE PCB, PR-133 <E>
	*A-7515-122-A	COMPLETE PCB, PR-133P <C>
4	*A-7515-120-A	COMPLETE PCB, TG-58 <E>
	*A-7515-121-A	COMPLETE PCB, TG-58P <C>
5	1-569-422-11	CONNECTOR, ROUND TYPE 20P, FEMALE
6	*1-633-852-11	PC BOARD, HN-134
7	*1-633-853-11	PC BOARD, HN-143 FLEXIBLE
8	*1-633-854-11	PC BOARD, HN-144 FLEXIBLE
9	*1-634-926-11	PC BOARD, FL-108
10	*1-945-457-12	HARNESS (12P)
	*1-563-936-11	HOUSING, CONNECTOR 2P
	*1-563-938-11	HOUSING, CONNECTOR 4P
	1-563-940-11	TERMINAL, SOLDERLESS
	*1-566-727-11	HOUSING, CONNECTOR 6P
	*1-569-579-11	CONNECTOR, ROUND TYPE 12P, MALE
11	*3-718-804-01	LUG, GROUND
12	*3-718-852-01	GUIDE (2), CONNECTOR
13	*3-718-855-01	PLATE, ORNAMENTAL
14	*3-718-856-02	CASE, LOWER, CCU
15	*3-718-857-02	CASE, UPPER, CCU
16	*3-718-858-01	CHASSIS (LEFT), SIDE, CCU
17	*3-718-859-01	CHASSIS (RIGHT), SIDE, CCU
18	*3-718-860-01	PANEL, REAR, CCU
19	*X-3683-238-1	SUB ASSY, FRONT, CCU
20	*3-748-001-01	PLATE, SHIELD, TG
21	*3-748-002-01	PLATE, SHIELD, PR
	7-621-772-00	SCREW +B 2x3
	7-621-775-10	SCREW +B 2.6x4
	7-627-452-28	SCREW, PRECISION +K 2.0x4.0
	7-627-553-48	SCREW, PRECISION +P 2.0x4.0
	7-627-556-38	SCREW, PRECISION +P 2.6x4.0
30	*9-911-839-99	CUSHION


+P2x4 PRECISION
+K2x4 PRECISION
※2
15
21
3
※3
+P2x4 PRECISION
6
4
20
+B2.6x4
12
+P2x4 PRECISION
11
9
10
18
8
※1
2
+B2.6x4
+B2.6x4
※2
17
7
+P2x4 PRECISION
+P2x4 PRECISION
30
1
+P2.6x4 PRECISION
+B2x3
16
19
14
※1
+B2x3
+P2x4 PRECISION
5
※3
+P2x4 PRECISION
+K2x4 PRECISION
13
+P2.6x4 PRECISION
+P2x4 PRECISION

C-4. ACCESSORIES AND PACKING MATERIALS

Accessories

No.	Parts No.	Description <Note>
1	*3-718-851-01	BRACKET, CABLE HORIZONTAL-OUT
2	*3-718-864-01	STOPPER
⚠3	3-751-384-11	MANUAL, INSTRUCTION
	7-627-556-28	SCREW, PRECISION +P 2.6x3.5
	7-628-253-20	SCREW +PS 2x6



SECTION D
CONVERSION TABLE FOR DECIMAL INTEGERS AND HEXADECIMAL INTEGERS

表の読み方

10進数　16進数（スイッチの設定）
↓　↓
1 : 001
2 : 002

表No.	頁	10進数範囲	16進数範囲
1	2	1～ 700	001～2BC
2	3	701～1400	2BD～578
3	4	1401～2100	579～834
4	5	2101～2800	835～AF0
5	6	2801～3500	AF1～DAC
6	7	3501～4095	DAD～FFF

How to read the table.

Decimal integers　Hexadecimal integers (Switch setting)
↓　↓
1 : 001
2 : 002

Table No.	Page	Decimal integers area	Hexadecimal integers area
1	2	1～ 700	001～2BC
2	3	701～1400	2BD～578
3	4	1401～2100	579～834
4	5	2101～2800	835～AF0
5	6	2801～3500	AF1～DAC
6	7	3501～4095	DAD～FFF

No. 1 (1···700／001···2BC)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
1	001	71	047	141	08D	211	0D3	281	119	351	15F	421	1A5	491	1EB	561	231	631	277
2	002	72	048	142	08E	212	0D4	282	11A	352	160	422	1A6	492	1EC	562	232	632	278
3	003	73	049	143	08F	213	0D5	283	11B	353	161	423	1A7	493	1ED	563	233	633	279
4	004	74	04A	144	090	214	0D6	284	11C	354	162	424	1A8	494	1EE	564	234	634	27A
5	005	75	04B	145	091	215	0D7	285	11D	355	163	425	1A9	495	1EF	565	235	635	27B
6	006	76	04C	146	092	216	0D8	286	11E	356	164	426	1AA	496	1F0	566	236	636	27C
7	007	77	04D	147	093	217	0D9	287	11F	357	165	427	1AB	497	1F1	567	237	637	27D
8	008	78	04E	148	094	218	0DA	288	120	358	166	428	1AC	498	1F2	568	238	638	27E
9	009	79	04F	149	095	219	0DB	289	121	359	167	429	1AD	499	1F3	569	239	639	27F
10	00A	80	050	150	096	220	0DC	290	122	360	168	430	1AE	500	1F4	570	23A	640	280
11	00B	81	051	151	097	221	0DD	291	123	361	169	431	1AF	501	1F5	571	23B	641	281
12	00C	82	052	152	098	222	0DE	292	124	362	16A	432	1B0	502	1F6	572	23C	642	282
13	00D	83	053	153	099	223	0DF	293	125	363	16B	433	1B1	503	1F7	573	23D	643	283
14	00E	84	054	154	09A	224	0E0	294	126	364	16C	434	1B2	504	1F8	574	23E	644	284
15	00F	85	055	155	09B	225	0E1	295	127	365	16D	435	1B3	505	1F9	575	23F	645	285
16	010	86	056	156	09C	226	0E2	296	128	366	16E	436	1B4	506	1FA	576	240	646	286
17	011	87	057	157	09D	227	0E3	297	129	367	16F	437	1B5	507	1FB	577	241	647	287
18	012	88	058	158	09E	228	0E4	298	12A	368	170	438	1B6	508	1FC	578	242	648	288
19	013	89	059	159	09F	229	0E5	299	12B	369	171	439	1B7	509	1FD	579	243	649	289
20	014	90	05A	160	0A0	230	0E6	300	12C	370	172	440	1B8	510	1FE	580	244	650	28A
21	015	91	05B	161	0A1	231	0E7	301	12D	371	173	441	1B9	511	2FF	581	245	651	28B
22	016	92	05C	162	0A2	232	0E8	302	12E	372	174	442	1BA	512	200	582	246	652	28C
23	017	93	05D	163	0A3	233	0E9	303	12F	373	175	443	1BB	513	201	583	247	653	28D
24	018	94	05E	164	0A4	234	0EA	304	130	374	176	444	1BC	514	202	584	248	654	28E
25	019	95	05F	165	0A5	235	0EB	305	131	375	177	445	1BD	515	203	585	249	655	28F
26	01A	96	060	166	0A6	236	0EC	306	132	376	178	446	1BE	516	204	586	24A	656	290
27	01B	97	061	167	0A7	237	0ED	307	133	377	179	447	1BF	517	205	587	24B	657	291
28	01C	98	062	168	0A8	238	0EE	308	134	378	17A	448	1C0	518	206	588	24C	658	292
29	01D	99	063	169	0A9	239	0EF	309	135	379	17B	449	1C1	519	207	589	24D	659	293
30	01E	100	064	170	0AA	240	0F0	310	136	380	17C	450	1C2	520	208	590	24E	660	294
31	01F	101	065	171	0AB	241	0F1	311	137	381	17D	451	1C3	521	209	591	24F	661	295
32	020	102	066	172	0AC	242	0F2	312	138	382	17E	452	1C4	522	20A	592	250	662	296
33	021	103	067	173	0AD	243	0F3	313	139	383	17F	453	1C5	523	20B	593	251	663	297
34	022	104	068	174	0AE	244	0F4	314	13A	384	180	454	1C6	524	20C	594	252	664	298
35	023	105	069	175	0AF	245	0F5	315	13B	385	181	455	1C7	525	20D	595	253	665	299
36	024	106	06A	176	0B0	246	0F6	316	13C	386	182	456	1C8	526	20E	596	254	666	29A
37	025	107	06B	177	0B1	247	0F7	317	13D	387	183	457	1C9	527	20F	597	255	667	29B
38	026	108	06C	178	0B2	248	0F8	318	13E	388	184	458	1CA	528	210	598	256	668	29C
39	027	109	06D	179	0B3	249	0F9	319	13F	389	185	459	1CB	529	211	599	257	669	29D
40	028	110	06E	180	0B4	250	0FA	320	140	390	186	460	1CC	530	212	600	258	670	29E
41	029	111	06F	181	0B5	251	0FB	321	141	391	187	461	1CD	531	213	601	259	671	29F
42	02A	112	070	182	0B6	252	0FC	322	142	392	188	462	1CE	532	214	602	25A	672	2A0
43	02B	113	071	183	0B7	253	0FD	323	143	393	189	463	1CF	533	215	603	25B	673	2A1
44	02C	114	072	184	0B8	254	0FE	324	144	394	18A	464	1D0	534	216	604	25C	674	2A2
45	02D	115	073	185	0B9	255	0FF	325	145	395	18B	465	1D1	535	217	605	25D	675	2A3
46	02E	116	074	186	0BA	256	100	326	146	396	18C	466	1D2	536	218	606	25E	676	2A4
47	02F	117	075	187	0BB	257	101	327	147	397	18D	467	1D3	537	219	607	25F	677	2A5
48	030	118	076	188	0BC	258	102	328	148	398	18E	468	1D4	538	21A	608	260	678	2A6
49	031	119	077	189	0BD	259	103	329	149	399	18F	469	1D5	539	21B	609	261	679	2A7
50	032	120	078	190	0BE	260	104	330	14A	400	190	470	1D6	540	21C	610	262	680	2A8
51	033	121	079	191	0BF	261	105	331	14B	401	191	471	1D7	541	21D	611	263	681	2A9
52	034	122	07A	192	0C0	262	106	332	14C	402	192	472	1D8	542	21E	612	264	682	2AA
53	035	123	07B	193	0C1	263	107	333	14D	403	193	473	1D9	543	21F	613	265	683	2AB
54	036	124	07C	194	0C2	264	108	334	14E	404	194	474	1DA	544	220	614	266	684	2AC
55	037	125	07D	195	0C3	265	109	335	14F	405	195	475	1DB	545	221	615	267	685	2AD
56	038	126	07E	196	0C4	266	10A	336	150	406	196	476	1DC	546	222	616	268	686	2AE
57	039	127	07F	197	0C5	267	10B	337	151	407	197	477	1DD	547	223	617	269	687	2AF
58	03A	128	080	198	0C6	268	10C	338	152	408	198	478	1DE	548	224	618	26A	688	2B0
59	03B	129	081	199	0C7	269	10D	339	153	409	199	479	1DF	549	225	619	26B	689	2B1
60	03C	130	082	200	0C8	270	10E	340	154	410	19A	480	1E0	550	226	620	26C	690	2B2
61	03D	131	083	201	0C9	271	10F	341	155	411	19B	481	1E1	551	227	621	26D	691	2B3
62	03E	132	084	202	0CA	272	110	342	156	412	19C	482	1E2	552	228	622	26E	692	2B4
63	03F	133	085	203	0CB	273	111	343	157	413	19D	483	1E3	553	229	623	26F	693	2B5
64	040	134	086	204	0CC	274	112	344	158	414	19E	484	1E4	554	22A	624	270	694	2B6
65	041	135	087	205	0CD	275	113	345	159	415	19F	485	1E5	555	22B	625	271	695	2B7
66	042	136	088	206	0CE	276	114	346	15A	416	1A0	486	1E6	556	22C	626	272	696	2B8
67	043	137	089	207	0CF	277	115	347	15B	417	1A1	487	1E7	557	22D	627	273	697	2B9
68	044	138	08A	208	0D0	278	116	348	15C	418	1A2	488	1E8	558	22E	628	274	698	2BA
69	045	139	08B	209	0D1	279	117	349	15D	419	1A3	489	1E9	559	22F	629	275	699	2BB
70	046	140	08C	210	0D2	280	118	350	15E	420	1A4	490	1EA	560	230	630	276	700	2BC

10	16
631	277
632	278
633	279
634	27A
635	27B
636	27C
637	27D
638	27E
639	27F
640	280
641	281
642	282
643	283
644	284
645	285
646	286
647	287
648	288
649	289
650	28A
651	28B
652	28C
653	28D
654	28E
655	28F
656	290
657	291
658	292
659	293
660	294
661	295
662	296
663	297
664	298
665	299
666	29A
667	29B
668	29C
669	29D
670	29E
671	29F
672	2A0
673	2A1
674	2A2
675	2A3
676	2A4
677	2A5
678	2A6
679	2A7
680	2A8
681	2A9
682	2AA
683	2AB
684	2AC
685	2AD
686	2AE
687	2AF
688	2B0
689	2B1
690	2B2
691	2B3
692	2B4
693	2B5
694	2B6
695	2B7
696	2B8
697	2B9
698	2BA
699	2BB
700	2BC

No. 2 (701・・・1400／2BD・・・578)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
701	2BD	771	303	841	349	911	38F	981	3D5	1051	41B	1121	461	1191	4A7	1261	4ED	1331	533
702	2BE	772	304	842	34A	912	390	982	3D6	1052	41C	1122	462	1192	4A8	1262	4EE	1332	534
703	2BF	773	305	843	34B	913	391	983	3D7	1053	41D	1123	463	1193	4A9	1263	4EF	1333	535
704	2C0	774	306	844	34C	914	392	984	3D8	1054	41E	1124	464	1194	4AA	1264	4F0	1334	536
705	2C1	775	307	845	34D	915	393	985	3D9	1055	41F	1125	465	1195	4AB	1265	4F1	1335	537
706	2C2	776	308	846	34E	916	394	986	3DA	1056	420	1126	466	1196	4AC	1266	4F2	1336	538
707	2C3	777	309	847	34F	917	395	987	3DB	1057	421	1127	467	1197	4AD	1267	4F3	1337	539
708	2C4	778	30A	848	350	918	396	988	3DC	1058	422	1128	468	1198	4AE	1268	4F4	1338	53A
709	2C5	779	30B	849	351	919	397	989	3DD	1059	423	1129	469	1199	4AF	1269	4F5	1339	53B
710	2C6	780	30C	850	352	920	398	990	3DE	1060	424	1130	46A	1200	4B0	1270	4F6	1340	53C
711	2C7	781	30D	851	353	921	399	991	3DF	1061	425	1131	46B	1201	4B1	1271	4F7	1341	53D
712	2C8	782	30E	852	354	922	39A	992	3E0	1062	426	1132	46C	1202	4B2	1272	4F8	1342	53E
713	2C9	783	30F	853	355	923	39B	993	3E1	1063	427	1133	46D	1203	4B3	1273	4F9	1343	53F
714	2CA	784	310	854	356	924	39C	994	3E2	1064	428	1134	46E	1204	4B4	1274	4FA	1344	540
715	2CB	785	311	855	357	925	39D	995	3E3	1065	429	1135	46F	1205	4B5	1275	4FB	1345	541
716	2CC	786	312	856	358	926	39E	996	3E4	1066	42A	1136	470	1206	4B6	1276	4FC	1346	542
717	2CD	787	313	857	359	927	39F	997	3E5	1067	42B	1137	471	1207	4B7	1277	4FD	1347	543
718	2CE	788	314	858	35A	928	3A0	998	3E6	1068	42C	1138	472	1208	4B8	1278	4FE	1348	544
719	2CF	789	315	859	35B	929	3A1	999	3E7	1069	42D	1139	473	1209	4B9	1279	4FF	1349	545
720	2D0	790	316	860	35C	930	3A2	1000	3E8	1070	42E	1140	474	1210	4BA	1280	500	1350	546
721	2D1	791	317	861	35D	931	3A3	1001	3E9	1071	42F	1141	475	1211	4BB	1281	501	1351	547
722	2D2	792	318	862	35E	932	3A4	1002	3EA	1072	430	1142	476	1212	4BC	1282	502	1352	548
723	2D3	793	319	863	35F	933	3A5	1003	3EB	1073	431	1143	477	1213	4BD	1283	503	1353	549
724	2D4	794	31A	864	360	934	3A6	1004	3EC	1074	432	1144	478	1214	4BE	1284	504	1354	54A
725	2D5	795	31B	865	361	935	3A7	1005	3ED	1075	433	1145	479	1215	4BF	1285	505	1355	54B
726	2D6	796	31C	866	362	936	3A8	1006	3EE	1076	434	1146	47A	1216	4C0	1286	506	1356	54C
727	2D7	797	31D	867	363	937	3A9	1007	3EF	1077	435	1147	47B	1217	4C1	1287	507	1357	54D
728	2D8	798	31E	868	364	938	3AA	1008	3F0	1078	436	1148	47C	1218	4C2	1288	508	1358	54E
729	2D9	799	31F	869	365	939	3AB	1009	3F1	1079	437	1149	47D	1219	4C3	1289	509	1359	54F
730	2DA	800	320	870	366	940	3AC	1010	3F2	1080	438	1150	47E	1220	4C4	1290	50A	1360	550
731	2DB	801	321	871	367	941	3AD	1011	3F3	1081	439	1151	47F	1221	4C5	1291	50B	1361	551
732	2DC	802	322	872	368	942	3AE	1012	3F4	1082	43A	1152	480	1222	4C6	1292	50C	1362	552
733	2DD	803	323	873	369	943	3AF	1013	3F5	1083	43B	1153	481	1223	4C7	1293	50D	1363	553
734	2DE	804	324	874	36A	944	3B0	1014	3F6	1084	43C	1154	482	1224	4C8	1294	50E	1364	554
735	2DF	805	325	875	36B	945	3B1	1015	3F7	1085	43D	1155	483	1225	4C9	1295	50F	1365	555
736	2E0	806	326	876	36C	946	3B2	1016	3F8	1086	43E	1156	484	1226	4CA	1296	510	1366	556
737	2E1	807	327	877	36D	947	3B3	1017	3F9	1087	43F	1157	485	1227	4CB	1297	511	1367	557
738	2E2	808	328	878	36E	948	3B4	1018	3FA	1088	440	1158	486	1228	4CC	1298	512	1368	558
739	2E3	809	329	879	36F	949	3B5	1019	3FB	1089	441	1159	487	1229	4CD	1299	513	1369	559
740	2E4	810	32A	880	370	950	3B6	1020	3FC	1090	442	1160	488	1230	4CE	1300	514	1370	55A
741	2E5	811	32B	881	371	951	3B7	1021	3FD	1091	443	1161	489	1231	4CF	1301	515	1371	55B
742	2E6	812	32C	882	372	952	3B8	1022	3FE	1092	444	1162	48A	1232	4D0	1302	516	1372	55C
743	2E7	813	32D	883	373	953	3B9	1023	3FF	1093	445	1163	48B	1233	4D1	1303	517	1373	55D
744	2E8	814	32E	884	374	954	3BA	1024	400	1094	446	1164	48C	1234	4D2	1304	518	1374	55E
745	2E9	815	32F	885	375	955	3BB	1025	401	1095	447	1165	48D	1235	4D3	1305	519	1375	55F
746	2EA	816	330	886	376	956	3BC	1026	402	1096	448	1166	48E	1236	4D4	1306	51A	1376	560
747	2EB	817	331	887	377	957	3BD	1027	403	1097	449	1167	48F	1237	4D5	1307	51B	1377	561
748	2EC	818	332	888	378	958	3BE	1028	404	1098	44A	1168	490	1238	4D6	1308	51C	1378	562
749	2ED	819	333	889	379	959	3BF	1029	405	1099	44B	1169	491	1239	4D7	1309	51D	1379	563
750	2EE	820	334	890	37A	960	3C0	1030	406	1100	44C	1170	492	1240	4D8	1310	51E	1380	564
751	2EF	821	335	891	37B	961	3C1	1031	407	1101	44D	1171	493	1241	4D9	1311	51F	1381	565
752	2F0	822	336	892	37C	962	3C2	1032	408	1102	44E	1172	494	1242	4DA	1312	520	1382	566
753	2F1	823	337	893	37D	963	3C3	1033	409	1103	44F	1173	495	1243	4DB	1313	521	1383	567
754	2F2	824	338	894	37E	964	3C4	1034	40A	1104	450	1174	496	1244	4DC	1314	522	1384	568
755	2F3	825	339	895	37F	965	3C5	1035	40B	1105	451	1175	497	1245	4DD	1315	523	1385	569
756	2F4	826	33A	896	380	966	3C6	1036	40C	1106	452	1176	498	1246	4DE	1316	524	1386	56A
757	2F5	827	33B	897	381	967	3C7	1037	40D	1107	453	1177	499	1247	4DF	1317	525	1387	56B
758	2F6	828	33C	898	382	968	3C8	1038	40E	1108	454	1178	49A	1248	4E0	1318	526	1388	56C
759	2F7	829	33D	899	383	969	3C9	1039	40F	1109	455	1179	49B	1249	4E1	1319	527	1389	56D
760	2F8	830	33E	900	384	970	3CA	1040	410	1110	456	1180	49C	1250	4E2	1320	528	1390	56E
761	2F9	831	33F	901	385	971	3CB	1041	411	1111	457	1181	49D	1251	4E3	1321	529	1391	56F
762	2FA	832	340	902	386	972	3CC	1042	412	1112	458	1182	49E	1252	4E4	1322	52A	1392	570
763	2FB	833	341	903	387	973	3CD	1043	413	1113	459	1183	49F	1253	4E5	1323	52B	1393	571
764	2FC	834	342	904	388	974	3CE	1044	414	1114	45A	1184	4A0	1254	4E6	1324	52C	1394	572
765	2FD	835	343	905	389	975	3CF	1045	415	1115	45B	1185	4A1	1255	4E7	1325	52D	1395	573
766	2FE	836	344	906	38A	976	3D0	1046	416	1116	45C	1186	4A2	1256	4E8	1326	52E	1396	574
767	2FF	837	345	907	38B	977	3D1	1047	417	1117	45D	1187	4A3	1257	4E9	1327	52F	1397	575
768	300	838	346	908	38C	978	3D2	1048	418	1118	45E	1188	4A4	1258	4EA	1328	530	1398	576
769	301	839	347	909	38D	979	3D3	1049	419	1119	45F	1189	4A5	1259	4EB	1329	531	1399	577
770	302	840	348	910	38E	980	3D4	1050	41A	1120	460	1190	4A6	1260	4EC	1330	532	1400	578

No. 3 (1401・・・2100／579・・・834)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
1401	579	1471	5BF	1541	605	1611	64B	1681	691	1751	6D7	1821	71D	1891	763	1961	7A9	2031	7EF
1402	57A	1472	5C0	1542	606	1612	34C	1682	692	1752	6D8	1822	71E	1892	764	1962	7AA	2032	7F0
1403	57B	1473	5C1	1543	607	1613	34D	1683	693	1753	6D9	1823	71F	1893	765	1963	7AB	2033	7F1
1404	57C	1474	5C2	1544	608	1614	34E	1684	694	1754	6DA	1824	720	1894	766	1964	7AC	2034	7F2
1405	57D	1475	5C3	1545	609	1615	34F	1685	695	1755	6DB	1825	721	1895	767	1965	7AD	2035	7F3
1406	57E	1476	5C4	1546	60A	1616	350	1686	696	1756	6DC	1826	722	1896	768	1966	7AE	2036	7F4
1407	57F	1477	5C5	1547	60B	1617	351	1687	697	1757	6DD	1827	723	1897	769	1967	7AF	2037	7F5
1408	580	1478	5C6	1548	60C	1618	352	1688	698	1758	6DE	1828	724	1898	76A	1968	7B0	2038	7F6
1409	581	1479	5C7	1549	60D	1619	353	1689	699	1759	6DF	1829	725	1899	76B	1969	7B1	2039	7F7
1410	582	1480	5C8	1550	60E	1620	354	1690	69A	1760	6E0	1830	726	1900	76C	1970	7B2	2040	7F8
1411	583	1481	5C9	1551	60F	1621	355	1691	69B	1761	6E1	1831	727	1901	76D	1971	7B3	2041	7F9
1412	584	1482	5CA	1552	610	1622	356	1692	69C	1762	6E2	1832	728	1902	76E	1972	7B4	2042	7FA
1413	585	1483	5CB	1553	611	1623	357	1693	69D	1763	6E3	1833	729	1903	76F	1973	7B5	2043	7FB
1414	586	1484	5CC	1554	612	1624	358	1694	69E	1764	6E4	1834	72A	1904	770	1974	7B6	2044	7FC
1415	587	1485	5CD	1555	613	1625	359	1695	69F	1765	6E5	1835	72B	1905	771	1975	7B7	2045	7FD
1416	588	1486	5CE	1556	614	1626	35A	1696	6A0	1766	6E6	1836	72C	1906	772	1976	7B8	2046	7FE
1417	589	1487	5CF	1557	615	1627	35B	1697	6A1	1767	6E7	1837	72D	1907	773	1977	7B9	2047	7FF
1418	58A	1488	5D0	1558	616	1628	35C	1698	6A2	1768	6E8	1838	72E	1908	774	1978	7BA	2048	800
1419	58B	1489	5D1	1559	617	1629	35D	1699	6A3	1769	6E9	1839	72F	1909	775	1979	7BB	2049	801
1420	58C	1490	5D2	1560	618	1630	35E	1700	6A4	1770	6EA	1840	730	1910	776	1980	7BC	2050	802
1421	58D	1491	5D3	1561	619	1631	35F	1701	6A5	1771	6EB	1841	731	1911	777	1981	7BD	2051	803
1422	58E	1492	5D4	1562	61A	1632	360	1702	6A6	1772	6FC	1842	732	1912	778	1982	7BE	2052	804
1423	58F	1493	5D5	1563	61B	1633	361	1703	6A7	1773	6ED	1843	733	1913	779	1983	7BF	2053	805
1424	590	1494	5D6	1564	61C	1634	362	1704	6A8	1774	6EE	1844	734	1914	77A	1984	7C0	2054	806
1425	591	1495	5D7	1565	61D	1635	363	1705	6A9	1775	6EF	1845	735	1915	77B	1985	7C1	2055	807
1426	592	1496	5D8	1566	61E	1636	364	1706	6AA	1776	6F0	1846	736	1916	77C	1986	7C2	2056	808
1427	593	1497	5D9	1567	61F	1637	365	1707	6AB	1777	6F1	1847	737	1917	77D	1987	7C3	2057	809
1428	594	1498	5DA	1568	620	1638	366	1708	6AC	1778	6F2	1848	738	1918	77E	1988	7C4	2058	80A
1429	595	1499	5DB	1569	621	1639	367	1709	6AD	1779	6F3	1849	739	1919	77F	1989	7C5	2059	80B
1430	596	1500	5DC	1570	622	1640	368	1710	6AE	1780	6F4	1850	73A	1920	780	1990	7C6	2060	80C
1431	597	1501	5DD	1571	623	1641	369	1711	6AF	1781	6F5	1851	73B	1921	781	1991	7C7	2061	80D
1432	598	1502	5DE	1572	624	1642	36A	1712	6B0	1782	6F6	1852	73C	1922	782	1992	7C8	2062	80E
1433	599	1503	5DF	1573	625	1643	36B	1713	6B1	1783	6F7	1853	73D	1923	783	1993	7C9	2063	80F
1434	59A	1504	5E0	1574	626	1644	36C	1714	6B2	1784	6F8	1854	73E	1924	784	1994	7CA	2064	810
1435	59B	1505	5E1	1575	627	1645	36D	1715	6B3	1785	6F9	1855	73F	1925	785	1995	7CB	2065	811
1436	59C	1506	5E2	1576	628	1646	36E	1716	6B4	1786	6FA	1856	740	1926	786	1996	7CC	2066	812
1437	59D	1507	5E3	1577	629	1647	36F	1717	6B5	1787	6FB	1857	741	1927	787	1997	7CD	2067	813
1438	59E	1508	5E4	1578	62A	1648	370	1718	6B6	1788	6FC	1858	742	1928	788	1998	7CE	2068	814
1439	59F	1509	5E5	1579	62B	1649	371	1719	6B7	1789	6FD	1859	743	1929	789	1999	7CF	2069	815
1440	5A0	1510	5E6	1580	62C	1650	372	1720	6B8	1790	6FE	1860	744	1930	78A	2000	7D0	2070	816
1441	5A1	1511	5E7	1581	62D	1651	373	1721	6B9	1791	6FF	1861	745	1931	78B	2001	7D1	2071	817
1442	5A2	1512	5E8	1582	62E	1652	374	1722	6BA	1792	700	1862	746	1932	78C	2002	7D2	2072	818
1443	5A3	1513	5E9	1583	62F	1653	375	1723	6BB	1793	701	1863	747	1933	78D	2003	7D3	2073	819
1444	5A4	1514	5EA	1584	630	1654	376	1724	6BC	1794	702	1864	748	1934	78E	2004	7D4	2074	81A
1445	5A5	1515	5EB	1585	631	1655	377	1725	6BD	1795	703	1865	749	1935	78F	2005	7D5	2075	81B
1446	5A6	1516	5EC	1586	632	1656	378	1726	6BE	1796	704	1866	74A	1936	790	2006	7D6	2076	81C
1447	5A7	1517	5ED	1587	633	1657	379	1727	6BF	1797	705	1867	74B	1937	791	2007	7D7	2077	81D
1448	5A8	1518	5EE	1588	634	1658	37A	1728	6C0	1798	706	1868	74C	1938	792	2008	7D8	2078	81E
1449	5A9	1519	5EF	1589	635	1659	37B	1729	6C1	1799	707	1869	74D	1939	793	2009	7D9	2079	81F
1450	5AA	1520	5F0	1590	636	1660	37C	1730	6C2	1800	708	1870	74E	1940	794	2010	7DA	2080	820
1451	5AB	1521	5F1	1591	637	1661	37D	1731	6C3	1801	709	1871	74F	1941	795	2011	7DB	2081	821
1452	5AC	1522	5F2	1592	638	1662	37E	1732	6C4	1802	70A	1872	750	1942	796	2012	7DC	2082	822
1453	5AD	1523	5F3	1593	639	1663	37F	1733	6C5	1803	70B	1873	751	1943	797	2013	7DD	2083	823
1454	5AE	1524	5F4	1594	63A	1664	380	1734	6C6	1804	70C	1874	752	1944	798	2014	7DE	2084	824
1455	5AF	1525	5F5	1595	63B	1665	381	1735	6C7	1805	70D	1875	753	1945	799	2015	7DF	2085	825
1456	5B0	1526	5F6	1596	63C	1666	382	1736	6C8	1806	70E	1876	754	1946	79A	2016	7E0	2086	826
1457	5B1	1527	5F7	1597	63D	1667	383	1737	6C9	1807	70F	1877	755	1947	79B	2017	7E1	2087	827
1458	5B2	1528	5F8	1598	63E	1668	384	1738	6CA	1808	710	1878	756	1948	79C	2018	7E2	2088	828
1459	5B3	1529	5F9	1599	63F	1669	385	1739	6CB	1809	711	1879	757	1949	79D	2019	7E3	2089	829
1460	5B4	1530	5FA	1600	640	1670	386	1740	6CC	1810	712	1880	758	1950	79E	2020	7E4	2090	82A
1461	5B5	1531	5FB	1601	641	1671	387	1741	6CD	1811	713	1881	759	1951	79F	2021	7E5	2091	82B
1462	5B6	1532	5FC	1602	642	1672	388	1742	6CE	1812	714	1882	75A	1952	7A0	2022	7E6	2092	82C
1463	5B7	1533	5FD	1603	643	1673	389	1743	6CF	1813	715	1883	75B	1953	7A1	2023	7E7	2093	82D
1464	5B8	1534	5FE	1604	644	1674	38A	1744	6D0	1814	716	1884	75C	1954	7A2	2024	7E8	2094	82E
1465	5B9	1535	5FF	1605	645	1675	38B	1745	6D1	1815	717	1885	75D	1955	7A3	2025	7E9	2095	82F
1466	5BA	1536	600	1606	646	1676	38C	1746	6D2	1816	718	1886	75E	1956	7A4	2026	7EA	2096	830
1467	5BB	1537	601	1607	647	1677	38D	1747	6D3	1817	719	1887	75F	1957	7A5	2027	7EB	2097	831
1468	5BC	1538	602	1608	648	1678	38E	1748	6D4	1818	71A	1888	760	1958	7A6	2028	7EC	2098	832
1469	5BD	1539	603	1609	649	1679	38F	1749	6D5	1819	71B	1889	761	1959	7A7	2029	7ED	2099	833
1470	5BE	1540	604	1610	64A	1680	390	1750	6D6	1820	71C	1890	762	1960	7A8	2030	7EE	2100	834

No. 4 (2101・・・2800/835・・・AF0)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
2101	835	2171	87B	2241	8C1	2311	907	2381	94D	2451	993	2521	9D9	2591	A1F	2661	A65	2731	AAB
2102	836	2172	87C	2242	8C2	2312	908	2382	94E	2452	994	2522	9DA	2592	A20	2662	A66	2732	AAC
2103	837	2173	87D	2243	8C3	2313	909	2383	94F	2453	995	2523	9DB	2593	A21	2663	A67	2733	AAD
2104	838	2174	87E	2244	8C4	2314	90A	2384	950	2454	996	2524	9DC	2594	A22	2664	A68	2734	AAE
2105	839	2175	87F	2245	8C5	2315	90B	2385	951	2455	997	2525	9DD	2595	A23	2665	A69	2735	AAF
2106	83A	2176	880	2246	8C6	2316	90C	2386	952	2456	998	2526	9DE	2596	A24	2666	A6A	2736	AB0
2107	83B	2177	881	2247	8C7	2317	90D	2387	953	2457	999	2527	9DF	2597	A25	2667	A6B	2737	AB1
2108	83C	2178	882	2248	8C8	2318	90E	2388	954	2458	99A	2528	9E0	2598	A26	2668	A6C	2738	AB2
2109	83D	2179	883	2249	8C9	2319	90F	2389	955	2459	99B	2529	9E1	2599	A27	2669	A6D	2739	AB3
2110	83E	2180	884	2250	8CA	2320	910	2390	956	2460	99C	2530	9E2	2600	A28	2670	A6E	2740	AB4
2111	83F	2181	885	2251	8CB	2321	911	2391	957	2461	99D	2531	9E3	2601	A29	2671	A6F	2741	AB5
2112	840	2182	886	2252	8CC	2322	912	2392	958	2462	99E	2532	9E4	2602	A2A	2672	A70	2742	AB6
2113	841	2183	887	2253	8CD	2323	913	2393	959	2463	99F	2533	9E5	2603	A2B	2673	A71	2743	AB7
2114	842	2184	888	2254	8CE	2324	914	2394	95A	2464	9A0	2534	9E6	2604	A2C	2674	A72	2744	AB8
2115	843	2185	889	2255	8CF	2325	915	2395	95B	2465	9A1	2535	9E7	2605	A2D	2675	A73	2745	AB9
2116	844	2186	88A	2256	8D0	2326	916	2396	95C	2466	9A2	2536	9E8	2606	A2E	2676	A74	2746	ABA
2117	845	2187	88B	2257	8D1	2327	917	2397	95D	2467	9A3	2537	9E9	2607	A2F	2677	A75	2747	ABB
2118	846	2188	88C	2258	8D2	2328	918	2398	95E	2468	9A4	2538	9EA	2608	A30	2678	A76	2748	ABC
2119	847	2189	88D	2259	8D3	2329	919	2399	95F	2469	9A5	2539	9EB	2609	A31	2679	A77	2749	ABD
2120	848	2190	88E	2260	8D4	2330	91A	2400	960	2470	9A6	2540	9EC	2610	A32	2680	A78	2750	ABE
2121	849	2191	88F	2261	8D5	2331	91B	2401	961	2471	9A7	2541	9ED	2611	A33	2681	A79	2751	ABF
2122	84A	2192	890	2262	8D6	2332	91C	2402	962	2472	9A8	2542	9EE	2612	A34	2682	A7A	2752	AC0
2123	84B	2193	891	2263	8D7	2333	91D	2403	963	2473	9A9	2543	9EF	2613	A35	2683	A7B	2753	AC1
2124	84C	2194	892	2264	8D8	2334	91E	2404	964	2474	9AA	2544	9F0	2614	A36	2684	A7C	2754	AC2
2125	84D	2195	893	2265	8D9	2335	91F	2405	965	2475	9AB	2545	9F1	2615	A37	2685	A7D	2755	AC3
2126	84E	2196	894	2266	8DA	2336	920	2406	966	2476	9AC	2546	9F2	2616	A38	2686	A7E	2756	AC4
2127	84F	2197	895	2267	8DB	2337	921	2407	967	2477	9AD	2547	9F3	2617	A39	2687	A7F	2757	AC5
2128	850	2198	896	2268	8DC	2338	922	2408	968	2478	9AE	2548	9F4	2618	A3A	2688	A80	2758	AC6
2129	851	2199	897	2269	8DD	2339	923	2409	969	2479	9AF	2549	9F5	2619	A3B	2689	A81	2759	AC7
2130	852	2200	898	2270	8DE	2340	924	2410	96A	2480	9B0	2550	9F6	2620	A3C	2690	A82	2760	AC8
2131	853	2201	899	2271	8DF	2341	925	2411	96B	2481	9B1	2551	9F7	2621	A3D	2691	A83	2761	AC9
2132	854	2202	89A	2272	8E0	2342	926	2412	96C	2482	9B2	2552	9F8	2622	A3E	2692	A84	2762	ACA
2133	855	2203	89B	2273	8E1	2343	927	2413	96D	2483	9B3	2553	9F9	2623	A3F	2693	A85	2763	ACB
2134	856	2204	89C	2274	8E2	2344	928	2414	96E	2484	9B4	2554	9FA	2624	A40	2694	A86	2764	ACC
2135	857	2205	89D	2275	8E3	2345	929	2415	96F	2485	9B5	2555	9FB	2625	A41	2695	A87	2765	ACD
2136	858	2206	89E	2276	8E4	2346	92A	2416	970	2486	9B6	2556	9FC	2626	A42	2696	A88	2766	ACE
2137	859	2207	89F	2277	8E5	2347	92B	2417	971	2487	9B7	2557	9FD	2627	A43	2697	A89	2767	ACF
2138	85A	2208	8A0	2278	8E6	2348	92C	2418	972	2488	9B8	2558	9FE	2628	A44	2698	A8A	2768	AD0
2139	85B	2209	8A1	2279	8E7	2349	92D	2419	973	2489	9B9	2559	9FF	2629	A45	2699	A8B	2769	AD1
2140	85C	2210	8A2	2280	8E8	2350	92E	2420	974	2490	9BA	2560	A00	2630	A46	2700	A8C	2770	AD2
2141	85D	2211	8A3	2281	8E9	2351	92F	2421	975	2491	9BB	2561	A01	2631	A47	2701	A8D	2771	AD3
2142	85E	2212	8A4	2282	8EA	2352	930	2422	976	2492	9BC	2562	A02	2632	A48	2702	A8E	2772	AD4
2143	85F	2213	8A5	2283	8EB	2353	931	2423	977	2493	9BD	2563	A03	2633	A49	2703	A8F	2773	AD5
2144	860	2214	8A6	2284	8EC	2354	932	2424	978	2494	9BE	2564	A04	2634	A4A	2704	A90	2774	AD6
2145	861	2215	8A7	2285	8ED	2355	933	2425	979	2495	9BF	2565	A05	2635	A4B	2705	A91	2775	AD7
2146	862	2216	8A8	2286	8EE	2356	934	2426	97A	2496	9C0	2566	A06	2636	A4C	2706	A92	2776	AD8
2147	863	2217	8A9	2287	8EF	2357	935	2427	97B	2497	9C1	2567	A07	2637	A4D	2707	A93	2777	AD9
2148	864	2218	8AA	2288	8F0	2358	936	2428	97C	2498	9C2	2568	A08	2638	A4E	2708	A94	2778	ADA
2149	865	2219	8AB	2289	8F1	2359	937	2429	97D	2499	9C3	2569	A09	2639	A4F	2709	A95	2779	ADB
2150	866	2220	8AC	2290	8F2	2360	938	2430	97E	2500	9C4	2570	A0A	2640	A50	2710	A96	2780	ADC
2151	867	2221	8AD	2291	8F3	2361	939	2431	97F	2501	9C5	2571	A0B	2641	A51	2711	A97	2781	ADD
2152	868	2222	8AE	2292	8F4	2362	93A	2432	980	2502	9C6	2572	A0C	2642	A52	2712	A98	2782	ADE
2153	869	2223	8AF	2293	8F5	2363	93B	2433	981	2503	9C7	2573	A0D	2643	A53	2713	A99	2783	ADF
2154	86A	2224	8B0	2294	8F6	2364	93C	2434	982	2504	9C8	2574	A0E	2644	A54	2714	A9A	2784	AE0
2155	86B	2225	8B1	2295	8F7	2365	93D	2435	983	2505	9C9	2575	A0F	2645	A55	2715	A9B	2785	AE1
2156	86C	2226	8B2	2296	8F8	2366	93E	2436	984	2506	9CA	2576	A10	2646	A56	2716	A9C	2786	AE2
2157	86D	2227	8B3	2297	8F9	2367	93F	2437	985	2507	9CB	2577	A11	2647	A57	2717	A9D	2787	AE3
2158	86E	2228	8B4	2298	8FA	2368	940	2438	986	2508	9CC	2578	A12	2648	A58	2718	A9E	2788	AE4
2159	86F	2229	8B5	2299	8FB	2369	941	2439	987	2509	9CD	2579	A13	2649	A59	2719	A9F	2789	AE5
2160	870	2230	8B6	2300	8FC	2370	942	2440	988	2510	9CE	2580	A14	2650	A5A	2720	AA0	2790	AE6
2161	871	2231	8B7	2301	8FD	2371	943	2441	989	2511	9CF	2581	A15	2651	A5B	2721	AA1	2791	AE7
2162	872	2232	8B8	2302	8FE	2372	944	2442	98A	2512	9D0	2582	A16	2652	A5C	2722	AA2	2792	AE8
2163	873	2233	8B9	2303	8FF	2373	945	2443	98B	2513	9D1	2583	A17	2653	A5D	2723	AA3	2793	AE9
2164	874	2234	8BA	2304	900	2374	946	2444	98C	2514	9D2	2584	A18	2654	A5E	2724	AA4	2794	AEA
2165	875	2235	8BB	2305	901	2375	947	2445	98D	2515	9D3	2585	A19	2655	A5F	2725	AA5	2795	AEB
2166	876	2236	8BC	2306	902	2376	948	2446	98E	2516	9D4	2586	A1A	2656	A60	2726	AA6	2796	AEC
2167	877	2237	8BD	2307	903	2377	949	2447	98F	2517	9D5	2587	A1B	2657	A61	2727	AA7	2797	AED
2168	878	2238	8BE	2308	904	2378	94A	2448	990	2518	9D6	2588	A1C	2658	A62	2728	AA8	2798	AEE
2169	879	2239	8BF	2309	905	2379	94B	2449	991	2519	9D7	2589	A1D	2659	A63	2729	AA9	2799	AEF
2170	87A	2240	8C0	2310	906	2380	94C	2450	992	2520	9D8	2590	A1E	2660	A64	2730	AAA	2800	AF0

No. 5 (2801・・・3500/AF1・・・DAC)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
2801	AF1	2871	B37	2941	B7D	3011	BC3	3081	C09	3151	C4F	3221	C95	3291	CDB	3361	D21	3431	D67
2802	AF2	2872	B38	2942	B7E	3012	BC4	3082	C0A	3152	C50	3222	C96	3292	CDC	3362	D22	3432	D68
2803	AF3	2873	B39	2943	B7F	3013	BC5	3083	C0B	3153	C51	3223	C97	3293	CDD	3363	D23	3433	D69
2804	AF4	2874	B3A	2944	B80	3014	BC6	3084	C0C	3154	C52	3224	C98	3294	CDE	3364	D24	3434	D6A
2805	AF5	2875	B3B	2945	B81	3015	BC7	3085	C0D	3155	C53	3225	C99	3295	CDF	3365	D25	3435	D6B
2806	AF6	2876	B3C	2946	B82	3016	BC8	3086	C0E	3156	C54	3226	C9A	3296	CE0	3366	D26	3436	D6C
2807	AF7	2877	B3D	2947	B83	3017	BC9	3087	C0F	3157	C55	3227	C9B	3297	CE1	3367	D27	3437	D6D
2808	AF8	2878	B3E	2948	B84	3018	BCA	3088	C10	3158	C56	3228	C9C	3298	CE2	3368	D28	3438	D6E
2809	AF9	2879	B3F	2949	B85	3019	BCB	3089	C11	3159	C57	3229	C9D	3299	CE3	3369	D29	3439	D6F
2810	AFA	2880	B40	2950	B86	3020	BCC	3090	C12	3160	C58	3230	C9E	3300	CE4	3370	D2A	3440	D70
2811	AFB	2881	B41	2951	B87	3021	BCD	3091	C13	3161	C59	3231	C9F	3301	CE5	3371	D2B	3441	D71
2812	AFC	2882	B42	2952	B88	3022	BCE	3092	C14	3162	C5A	3232	CA0	3302	CE6	3372	D2C	3442	D72
2813	AFD	2883	B43	2953	B89	3023	BCF	3093	C15	3163	C5B	3233	CA1	3303	CE7	3373	D2D	3443	D73
2814	AFE	2884	B44	2954	B8A	3024	BD0	3094	C16	3164	C5C	3234	CA2	3304	CE8	3374	D2E	3444	D74
2815	AFF	2885	B45	2955	B8B	3025	BD1	3095	C17	3165	C5D	3235	CA3	3305	CE9	3375	D2F	3445	D75
2816	B00	2886	B46	2956	B8C	3026	BD2	3096	C18	3166	C5E	3236	CA4	3306	CEA	3376	D30	3446	D76
2817	B01	2887	B47	2957	B8D	3027	BD3	3097	C19	3167	C5F	3237	CA5	3307	CEB	3377	D31	3447	D77
2818	B02	2888	B48	2958	B8E	3028	BD4	3098	C1A	3168	C60	3238	CA6	3308	CEC	3378	D32	3448	D78
2819	B03	2889	B49	2959	B8F	3029	BD5	3099	C1B	3169	C61	3239	CA7	3309	CED	3379	D33	3449	D79
2820	B04	2890	B4A	2960	B90	3030	BD6	3100	C1C	3170	C62	3240	CA8	3310	CEE	3380	D34	3450	D7A
2821	B05	2891	B4B	2961	B91	3031	BD7	3101	C1D	3171	C63	3241	CA9	3311	CEF	3381	D35	3451	D7B
2822	B06	2892	B4C	2962	B92	3032	BD8	3102	C1E	3172	C64	3242	CAA	3312	CF0	3382	D36	3452	D7C
2823	B07	2893	B4D	2963	B93	3033	BD9	3103	C1F	3173	C65	3243	CAB	3313	CF1	3383	D37	3453	D7D
2824	B08	2894	B4E	2964	B94	3034	BDA	3104	C20	3174	C66	3244	CAC	3314	CF2	3384	D38	3454	D7E
2825	B09	2895	B4F	2965	B95	3035	BDB	3105	C21	3175	C67	3245	CAD	3315	CF3	3385	D39	3455	D7F
2826	B0A	2896	B50	2966	B96	3036	BDC	3106	C22	3176	C68	3246	CAE	3316	CF4	3386	D3A	3456	D80
2827	B0B	2897	B51	2967	B97	3037	BDD	3107	C23	3177	C69	3247	CAF	3317	CF5	3387	D3B	3457	D81
2828	B0C	2898	B52	2968	B98	3038	BDE	3108	C24	3178	C6A	3248	CB0	3318	CF6	3388	D3C	3458	D82
2829	B0D	2899	B53	2969	B99	3039	BDF	3109	C25	3179	C6B	3249	CB1	3319	CF7	3389	D3D	3459	D83
2830	B0E	2900	B54	2970	B9A	3040	BE0	3110	C26	3180	C6C	3250	CB2	3320	CF8	3390	D3E	3460	D84
2831	B0F	2901	B55	2971	B9B	3041	BE1	3111	C27	3181	C6D	3251	CB3	3321	CF9	3391	D3F	3461	D85
2832	B10	2902	B56	2972	B9C	3042	BE2	3112	C28	3182	C6E	3252	CB4	3322	CFA	3392	D40	3462	D86
2833	B11	2903	B57	2973	B9D	3043	BE3	3113	C29	3183	C6F	3253	CB5	3323	CFB	3393	D41	3463	D87
2834	B12	2904	B58	2974	B9E	3044	BE4	3114	C2A	3184	C70	3254	CB6	3324	CFC	3394	D42	3464	D88
2835	B13	2905	B59	2975	B9F	3045	BE5	3115	C2B	3185	C71	3255	CB7	3325	CFD	3395	D43	3465	D89
2836	B14	2906	B5A	2976	BA0	3046	BE6	3116	C2C	3186	C72	3256	CB8	3326	CFE	3396	D44	3466	D8A
2837	B15	2907	B5B	2977	BA1	3047	BE7	3117	C2D	3187	C73	3257	CB9	3327	CFF	3397	D45	3467	D8B
2838	B16	2908	B5C	2978	BA2	3048	BE8	3118	C2E	3188	C74	3258	CBA	3328	D00	3398	D46	3468	D8C
2839	B17	2909	B5D	2979	BA3	3049	BE9	3119	C2F	3189	C75	3259	CBB	3329	D01	3399	D47	3469	D8D
2840	B18	2910	B5E	2980	BA4	3050	BEA	3120	C30	3190	C76	3260	CBC	3330	D02	3400	D48	3470	D8E
2841	B19	2911	B5F	2981	BA5	3051	BEB	3121	C31	3191	C77	3261	CBD	3331	D03	3401	D49	3471	D8F
2842	B1A	2912	B60	2982	BA6	3052	BEC	3122	C32	3192	C78	3262	CBE	3332	D04	3402	D4A	3472	D90
2843	B1B	2913	B61	2983	BA7	3053	BED	3123	C33	3193	C79	3263	CBF	3333	D05	3403	D4B	3473	D91
2844	B1C	2914	B62	2984	BA8	3054	BEE	3124	C34	3194	C7A	3264	CC0	3334	D06	3404	D4C	3474	D92
2845	B1D	2915	B63	2985	BA9	3055	BEF	3125	C35	3195	C7B	3265	CC1	3335	D07	3405	D4D	3475	D93
2846	B1E	2916	B64	2986	BAA	3056	BF0	3126	C36	3196	C7C	3266	CC2	3336	D08	3406	D4E	3476	D94
2847	B1F	2917	B65	2987	BAB	3057	BF1	3127	C37	3197	C7D	3267	CC3	3337	D09	3407	D4F	3477	D95
2848	B20	2918	B66	2988	BAC	3058	BF2	3128	C38	3198	C7E	3268	CC4	3338	D0A	3408	D50	3478	D96
2849	B21	2919	B67	2989	BAD	3059	BF3	3129	C39	3199	C7F	3269	CC5	3339	D0B	3409	D51	3479	D97
2850	B22	2920	B68	2990	BAE	3060	BF4	3130	C3A	3200	C80	3270	CC6	3340	D0C	3410	D52	3480	D98
2851	B23	2921	B69	2991	BAF	3061	BF5	3131	C3B	3201	C81	3271	CC7	3341	D0D	3411	D53	3481	D99
2852	B24	2922	B6A	2992	BB0	3062	BF6	3132	C3C	3202	C82	3272	CC8	3342	D0E	3412	D54	3482	D9A
2853	B25	2923	B6B	2993	BB1	3063	BF7	3133	C3D	3203	C83	3273	CC9	3343	D0F	3413	D55	3483	D9B
2854	B26	2924	B6C	2994	BB2	3064	BF8	3134	C3E	3204	C84	3274	CCA	3344	D10	3414	D56	3484	D9C
2855	B27	2925	B6D	2995	BB3	3065	BF9	3135	C3F	3205	C85	3275	CCB	3345	D11	3415	D57	3485	D9D
2856	B28	2926	B6E	2996	BB4	3066	BFA	3136	C40	3206	C86	3276	CCC	3346	D12	3416	D58	3486	D9E
2857	B29	2927	B6F	2997	BB5	3067	BFB	3137	C41	3207	C87	3277	CCD	3347	D13	3417	D59	3487	D9F
2858	B2A	2928	B70	2998	BB6	3068	BFC	3138	C42	3208	C88	3278	CCE	3348	D14	3418	D5A	3488	DA0
2859	B2B	2929	B71	2999	BB7	3069	BFD	3139	C43	3209	C89	3279	CCF	3349	D15	3419	D5B	3489	DA1
2860	B2C	2930	B72	3000	BB8	3070	BFE	3140	C44	3210	C8A	3280	CD0	3350	D16	3420	D5C	3490	DA2
2861	B2D	2931	B73	3001	BB9	3071	BFF	3141	C45	3211	C8B	3281	CD1	3351	D17	3421	D5D	3491	DA3
2862	B2E	2932	B74	3002	BBA	3072	C00	3142	C46	3212	C8C	3282	CD2	3352	D18	3422	D5E	3492	DA4
2863	B2F	2933	B75	3003	BBB	3073	C01	3143	C47	3213	C8D	3283	CD3	3353	D19	3423	D5F	3493	DA5
2864	B30	2934	B76	3004	BBC	3074	C02	3144	C48	3214	C8E	3284	CD4	3354	D1A	3424	D60	3494	DA6
2865	B31	2935	B77	3005	BBD	3075	C03	3145	C49	3215	C8F	3285	CD5	3355	D1B	3425	D61	3495	DA7
2866	B32	2936	B78	3006	BBE	3076	C04	3146	C4A	3216	C90	3286	CD6	3356	D1C	3426	D62	3496	DA8
2867	B33	2937	B79	3007	BBF	3077	C05	3147	C4B	3217	C91	3287	CD7	3357	D1D	3427	D63	3497	DA9
2868	B34	2938	B7A	3008	BC0	3078	C06	3148	C4C	3218	C92	3288	CD8	3358	D1E	3428	D64	3498	DAA
2869	B35	2939	B7B	3009	BC1	3079	C07	3149	C4D	3219	C93	3289	CD9	3359	D1F	3429	D65	3499	DAB
2870	B36	2940	B7C	3010	BC2	3080	C08	3150	C4E	3220	C94	3290	CDA	3360	D20	3430	D66	3500	DAC

No. 6

10	1
3501	D
3502	D
3503	D
3504	D
3505	D
3506	D
3507	D
3508	D
3509	D
3510	D
3511	D
3512	D
3513	D
3514	D
3515	D
3516	D
3517	D
3518	D
3519	D
3520	D
3521	D
3522	D
3523	D
3524	D
3525	D
3526	D
3527	D
3528	D
3529	D
3530	D
3531	D
3532	D
3533	D
3534	D
3535	D
3536	D
3537	D
3538	D
3539	D
3540	D
3541	DD
3542	DD
3543	DD
3544	DD
3545	DD
3546	DD
3547	DD
3548	DD
3549	DD
3550	DD
3551	DD
3552	DE
3553	DE
3554	DE
3555	DE
3556	DE
3557	DE
3558	DE
3559	DE
3560	DE
3561	DE
3562	DE
3563	DE
3564	DE
3565	DE
3566	DE
3567	DE
3568	DF
3569	DF
3570	DF

No. 6 (3501・・・4095/DAD・・・FFF)

10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16	10	16
3501	DAD	3571	DF3	3641	E39	3711	E7F	3781	EC5	3851	F0B	3921	F51	3991	F97	4061	FDD
3502	DAE	3572	DF4	3642	E3A	3712	E80	3782	EC6	3852	F0C	3922	F52	3992	F98	4062	FDE
3503	DAF	3573	DF5	3643	E3B	3713	E81	3783	EC7	3853	F0D	3923	F53	3993	F99	4063	FDF
3504	DB0	3574	DF6	3644	E3C	3714	E82	3784	EC8	3854	F0E	3924	F54	3994	F9A	4064	FE0
3505	DB1	3575	DF7	3645	E3D	3715	E83	3785	EC9	3855	F0F	3925	F55	3995	F9B	4065	FE1
3506	DB2	3576	DF8	3646	E3E	3716	E84	3786	ECA	3856	F10	3926	F56	3996	F9C	4066	FE2
3507	DB3	3577	DF9	3647	E3F	3717	E85	3787	ECB	3857	F11	3927	F57	3997	F9D	4067	FE3
3508	DB4	3578	DFA	3648	E40	3718	E86	3788	ECC	3858	F12	3928	F58	3998	F9E	4068	FE4
3509	DB5	3579	DFB	3649	E41	3719	E87	3789	ECD	3859	F13	3929	F59	3999	F9F	4069	FE5
3510	DB6	3580	DFC	3650	E42	3720	E88	3790	ECE	3860	F14	3930	F5A	4000	FA0	4070	FE6
3511	DB7	3581	DFD	3651	E43	3721	E89	3791	ECF	3861	F15	3931	F5B	4001	FA1	4071	FE7
3512	DB8	3582	DFE	3652	E44	3722	E8A	3792	ED0	3862	F16	3932	F5C	4002	FA2	4072	FE8
3513	DB9	3583	DFF	3653	E45	3723	E8B	3793	ED1	3863	F17	3933	F5D	4003	FA3	4073	FE9
3514	DBA	3584	E00	3654	E46	3724	E8C	3794	ED2	3864	F18	3934	F5E	4004	FA4	4074	FEA
3515	DBB	3585	E01	3655	E47	3725	E8D	3795	ED3	3865	F19	3935	F5F	4005	FA5	4075	FEB
3516	DBC	3586	E02	3656	E48	3726	E8E	3796	ED4	3866	F1A	3936	F60	4006	FA6	4076	FEC
3517	DBD	3587	E03	3657	E49	3727	E8F	3797	ED5	3867	F1B	3937	F61	4007	FA7	4077	FED
3518	DBE	3588	E04	3658	E4A	3728	E90	3798	ED6	3868	F1C	3938	F62	4008	FA8	4078	FEE
3519	DBF	3589	E05	3659	E4B	3729	E91	3799	ED7	3869	F1D	3939	F63	4009	FA9	4079	FEF
3520	DC0	3590	E06	3660	E4C	3730	E92	3800	ED8	3870	F1E	3940	F64	4010	FAA	4080	FF0
3521	DC1	3591	E07	3661	E4D	3731	E93	3801	ED9	3871	F1F	3941	F65	4011	FAB	4081	FF1
3522	DC2	3592	E08	3662	E4E	3732	E94	3802	EDA	3872	F20	3942	F66	4012	FAC	4082	FF2
3523	DC3	3593	E09	3663	E4F	3733	E95	3803	EDB	3873	F21	3943	F67	4013	FAD	4083	FF3
3524	DC4	3594	E0A	3664	E50	3734	E96	3804	EDC	3874	F22	3944	F68	4014	FAE	4084	FF4
3525	DC5	3595	E0B	3665	E51	3735	E97	3805	EDD	3875	F23	3945	F69	4015	FAF	4085	FF5
3526	DC6	3596	E0C	3666	E52	3736	E98	3806	EDE	3876	F24	3946	F6A	4016	FB0	4086	FF6
3527	DC7	3597	E0D	3667	E53	3737	E99	3807	EDF	3877	F25	3947	F6B	4017	FB1	4087	FF7
3528	DC8	3598	E0E	3668	E54	3738	E9A	3808	EE0	3878	F26	3948	F6C	4018	FB2	4088	FF8
3529	DC9	3599	E0F	3669	E55	3739	E9B	3809	EE1	3879	F27	3949	F6D	4019	FB3	4089	FF9
3530	DCA	3600	E10	3670	E56	3740	E9C	3810	EE2	3880	F28	3950	F6E	4020	FB4	4090	FFA
3531	DCB	3601	E11	3671	E57	3741	E9D	3811	EE3	3881	F29	3951	F6F	4021	FB5	4091	FFB
3532	DCC	3602	E12	3672	E58	3742	E9E	3812	EE4	3882	F2A	3952	F70	4022	FB6	4092	FFC
3533	DCD	3603	E13	3673	E59	3743	E9F	3813	EE5	3883	F2B	3953	F71	4023	FB7	4093	FFD
3534	DCE	3604	E14	3674	E5A	3744	EA0	3814	EE6	3884	F2C	3954	F72	4024	FB8	4094	FFE
3535	DCF	3605	E15	3675	E5B	3745	EA1	3815	EE7	3885	F2D	3955	F73	4025	FB9	4095	FFF
3536	DD0	3606	E16	3676	E5C	3746	EA2	3816	EE8	3886	F2E	3956	F74	4026	FBA		
3537	DD1	3607	E17	3677	E5D	3747	EA3	3817	EE9	3887	F2F	3957	F75	4027	FBB		
3538	DD2	3608	E18	3678	E5E	3748	EA4	3818	EEA	3888	F30	3958	F76	4028	FBC		
3539	DD3	3609	E19	3679	E5F	3749	EA5	3819	EEB	3889	F31	3959	F77	4029	FBD		
3540	DD4	3610	E1A	3680	E60	3750	EA6	3820	EEC	3890	F32	3960	F78	4030	FBE		
3541	DD5	3611	E1B	3681	E61	3751	EA7	3821	EED	3891	F33	3961	F79	4031	FBF		
3542	DD6	3612	E1C	3682	E62	3752	EA8	3822	EEE	3892	F34	3962	F7A	4032	FC0		
3543	DD7	3613	E1D	3683	E63	3753	EA9	3823	EEF	3893	F35	3963	F7B	4033	FC1		
3544	DD8	3614	E1E	3684	E64	3754	EAA	3824	EF0	3894	F36	3964	F7C	4034	FC2		
3545	DD9	3615	E1F	3685	E65	3755	EAB	3825	EF1	3895	F37	3965	F7D	4035	FC3		
3546	DDA	3616	E20	3686	E66	3756	EAC	3826	EF2	3896	F38	3966	F7E	4036	FC4		
3547	DDB	3617	E21	3687	E67	3757	EAD	3827	EF3	3897	F39	3967	F7F	4037	FC5		
3548	DDC	3618	E22	3688	E68	3758	EAE	3828	EF4	3898	F3A	3968	F80	4038	FC6		
3549	DDD	3619	E23	3689	E69	3759	EAF	3829	EF5	3899	F3B	3969	F81	4039	FC7		
3550	DDE	3620	E24	3690	E6A	3760	EB0	3830	EF6	3900	F3C	3970	F82	4040	FC8		
3551	DDF	3621	E25	3691	E6B	3761	EB1	3831	EF7	3901	F3D	3971	F83	4041	FC9		
3552	DE0	3622	E26	3692	E6C	3762	EB2	3832	EF8	3902	F3E	3972	F84	4042	FCA		
3553	DE1	3623	E27	3693	E6D	3763	EB3	3833	EF9	3903	F3F	3973	F85	4043	FCB		
3554	DE2	3624	E28	3694	E6E	3764	EB4	3834	EFA	3904	F40	3974	F86	4044	FCC		
3555	DE3	3625	E29	3695	E6F	3765	EB5	3835	EFB	3905	F41	3975	F87	4045	FCD		
3556	DE4	3626	E2A	3696	E70	3766	EB6	3836	EFC	3906	F42	3976	F88	4046	FCE		
3557	DE5	3627	E2B	3697	E71	3767	EB7	3837	EFD	3907	F43	3977	F89	4047	FCF		
3558	DE6	3628	E2C	3698	E72	3768	EB8	3838	EFE	3908	F44	3978	F8A	4048	FD0		
3559	DE7	3629	E2D	3699	E73	3769	EB9	3839	EFF	3909	F45	3979	F8B	4049	FD1		
3560	DE8	3630	E2E	3700	E74	3770	EBA	3840	F00	3910	F46	3980	F8C	4050	FD2		
3561	DE9	3631	E2F	3701	E75	3771	EBB	3841	F01	3911	F47	3981	F8D	4051	FD3		
3562	DEA	3632	E30	3702	E76	3772	EBC	3842	F02	3912	F48	3982	F8E	4052	FD4		
3563	DEB	3633	E31	3703	E77	3773	EBD	3843	F03	3913	F49	3983	F8F	4053	FD5		
3564	DEC	3634	E32	3704	E78	3774	EBE	3844	F04	3914	F4A	3984	F90	4054	FD6		
3565	DED	3635	E33	3705	E79	3775	EBF	3845	F05	3915	F4B	3985	F91	4055	FD7		
3566	DEE	3636	E34	3706	E7A	3776	EC0	3846	F06	3916	F4C	3986	F92	4056	FD8		
3567	DEF	3637	E35	3707	E7B	3777	EC1	3847	F07	3917	F4D	3987	F93	4057	FD9		
3568	DF0	3638	E36	3708	E7C	3778	EC2	3848	F08	3918	F4E	3988	F94	4058	FDA		
3569	DF1	3639	E37	3709	E7D	3779	EC3	3849	F09	3919	F4F	3989	F95	4059	FDB		
3570	DF2	3640	E38	3710	E7E	3780	EC4	3850	F0A	3920	F50	3990	F96	4060	FDC		

CAMERA ADAPTOR
DC-77RR/77RR-CE

TABLE OF CONTENTS

1. SPECIFICATIONS 1

2. DIMENSIONS 2

3. THEORY OF OPERATION 3

3-1. CN-353 BOARD 3
3-2. CN-355 BOARD 3
3-3. FU-49 BOARD 4
3-4. LED-94 BOARD 4
3-5. SWITCHING REGULATOR 4

4. DIAGRAMS 5

4-1. BLOCK DIAGRAM 5
4-2. MOUNTING DIAGRAM (911 Lot. to 003 Lot.) 7
4-3. SCHEMATIC DIAGRAM (911 Lot. to 003 Lot.) 9
4-4. MOUNTING DIAGRAM (004 Lot. and Higher Lot.) 13
4-5. SCHEMATIC DIAGRAM (004 Lot. and Higher Lot.) 15

5. PARTS LIST 18

5-1. EXPLODED VIEW 18
5-2. ACCESSORIES 20
5-3. ELECTRICAL PARTS LIST 21
    CN-353 Board 21
    CN-355 Board 22
    FU-49 Board 22
    LED-92 Board 22

SECTION 1
SPECIFICATIONS

〈カメラアダプター　DC-77RR〉

電源電圧	AC100V, 50/60Hz
入力電流	0.4A
出力電圧	DC12V
最大出力電流	1.2A
入出力端子	カメラ接続用端子：12ピン1個
	カメラ接続用端子(ダミーボックス)：12ピン1個
	カメラアダプター接続用端子(ダミーボックス)：12ピン1個
	VIDEO OUT端子：BNC型2個
	映像0.7Vp-p, 同期0.3Vp-p, 75Ω, 不平衡, 同期負
	EXT-SYNC H端子：BNC型2個
	ループスルー, 75Ω終端スイッチ付き
	EXT-SYNC V/RST端子：BNC型2個
	ループスルー, 75Ω終端スイッチ付き
	CLOCK OUT端子：BNC型1個
使用温度	−5℃～+45℃
保存温度	−25℃～+60℃
耐振動性	2.2G
耐衝撃性	40G
最大外形寸法	150×55×220mm(幅/高さ/奥行き), 最大突起部を含まず
重量	1.3kg
付属品	電源コード(1), 取扱説明書(1)

仕様および外観は, 改良のため予告なく変更することがありますが, ご了承ください。

<DC-77RR/77RR-CE Camera adaptor>

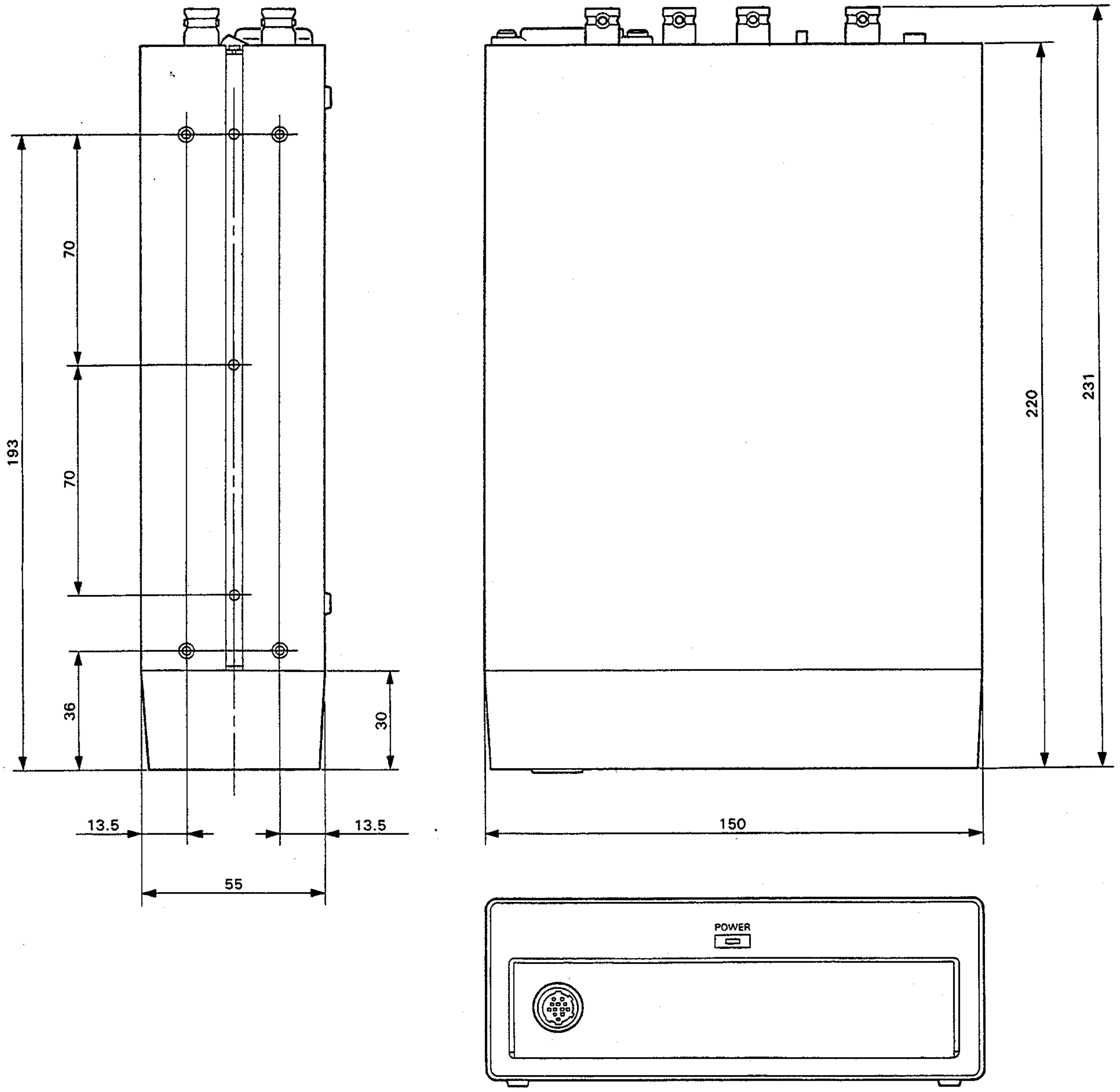
Power requirement	DC-77RR: 120V AC, 50/60 Hz
	DC-77RR-CE: 220 to 240 V AC, 50 hz
Input current	DC-77RR: 0.35 A
	DC-77RR-CE: 0.25 A
Output voltage	12 V DC
Maximum output current	1.2 A
Input and output connectors	Camera: 12-pin x 1
	Camera (dummy box): 12-pin x 1
	Camera adaptor (dummy box): 12-pin x 1
	VIDEO OUT: BNC type x 2
	VBS 0.7 Vp-p, sync 0.3 Vp-p, 75 Ω, unbalanced sync negative
	EXT-SYNC H: BNC type x 2
	Loop through with a 75 Ω termination switch
	EXT-SYNC V/RST: BNC type x 2
	Loop through with a 75 Ω termination switch
Operating temperature	−5°C～+45°C (+23 to +113°F)
Storage temperature	−25 to +60°C (+13 to +140°F)
High vibration resistance	2.2G
High mechanical shock resistance	40G
Dimensions	150 x 55 x 220 mm (w/h/d), (6 x $2^1/_4 \times 8^3/_4$ inches), not including projecting parts
Weight	About 1.3 kg (2 lb 11 oz)
Supplied accessories	Power cord (1)
	Operation manual (1)

Design and specifications are subject to change without notice.

SECTION 2
DIMENSIONS

カメラアダプター 〈DC-77RR〉

Camera adaptor ＜DC-77RR/77RR-CE＞


70
70
193
36
30
13.5
13.5
55
150
220
231
POWER

SECTION 3
THEORY OF OPERATIONS

3-1. CN-353 BOARD

CN-353基板には，カメラモジュールから送られてくるビデオ信号を2系統に分配するためのビデオアンプがあります。また，リアパネル部のBNCコネクタ(CN3〜CN7)とカメラモジュール側とをスルーで結んでいます。

CN8の2番ピンに入力されたビデオ信号は，R3で終端され100 IRE（100%）のとき700mVp-pとなり，2本に分岐して，それぞれビデオアンプに入力されます。1つはQ2〜Q8で，もう1つはQ10〜Q16で構成されています。各ビデオアンプは，非反転アンプ(ゲイン2倍)として動作します。

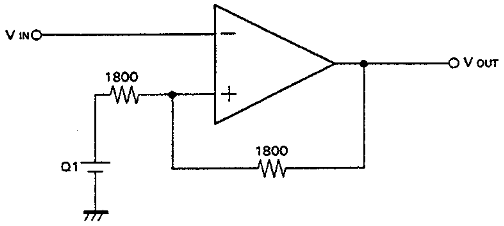


図1. ビデオアンプ

従って，2系統のVIDEO OUT（CN1，CN2）は，それぞれ1400mVp-pの出力となり，また，75Ωで終端した時は，700mVp-pとなります。

尚，L1とC25，およびL2とC26は，それぞれ不要輻射対策用のローパスフィルタです。また，L3とC29，およびL4とC30は，それぞれ14MHzのトラップフィルタです。

IC1は，スイッチングレギュレータから供給された＋12Vから＋8Vのレギュレーション出力を得る三端子レギュレータです。IC1から各ビデオアンプに電源を供給します。

SW1とSW2は，入出力信号に対する75Ω終端ON/OFFスイッチです。

3-2. CN355 BOARD

CN-355基板は，本体に1枚，ダミーボックスに2枚使われています。それぞれ12ピンコネクタを中継しています。

3-1. CN-353 BOARD

CN-353 board has a video amplifier for distributing the video signals received from the camera module to two systems. In addition, the BNC connector (CN3 through CN7) on the rear panel is connected with the camera module side through this board.

The video signal input at pin 2 of CN 8 is terminated at R3, and it is at 700 mVp-p at 100 IRE (100%). The video signal input is divided into two groups, and each group is input to a video amplifier. One is composed of Q2 through Q8 and the other with Q10 through Q16. Each video amplifier operates as a non-inverse amplifier (doubel the gain).

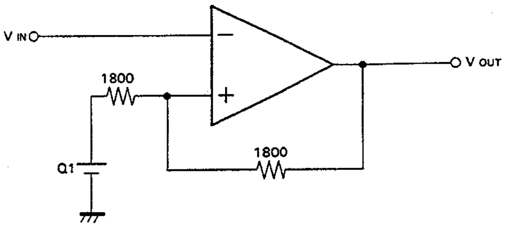


Fig. 1 Video Amplifier

Therefore, the VIDEO OUT (CN1 and CN2) to each of the two systems is 1400 mVp-p, and 700 mVp-p when terminated with 75 ohms.
In addition, L1 and C25, and L2 and C26 are both low-pass filters for controlling unnecessary radiation. In addition, L3 and C29, and L4 and C30 are both 14 MHz trap filters.

IC1 is a three-terminal regulator receiving the regulation output between +12V and +8V supplied by the swithing regulator. Power is supplied to each video amplifier from the IC1.

SW1 and SW2 are 75Ω termination ON/OFF switch for input-output signals.

3-2. CN-355 BOARD

One CN-355 board is used in the main unit and two in the dummy box. Each relays the 12-pin connector.

3-3. FU-49 BOARD

FU-49基板には，ヒューズ(F1)があります。これは安全重要部品ですから交換する場合は，指定の部品を使用して下さい。

DC-77RR　: 2A　125V
DC-77RR-CE : 1A　250V

3-4. LED-92 BOARD

LED-92基板は，2枚使われています。それぞれ緑色のLEDが1つあり，電源オンで点灯します。CN-353基板を介して2つのLEDが直列に接続されています。

3-5. SWITCHING REGULATOR

スイッチングレギュレータは，CN101の1番ピンと3番ピンに外部からの交流電源を入力し，CN101の7番ピンから+12V DCを出力します。

入力電圧	AC85V〜264V
入力電流	0.3A以下(入力電圧100Vの時)
入力周波数	47Hz〜440Hz

出力電圧	12.0V±0.1V
出力電流	1.3A(最大)

3-3. FU-49 BOARD

FU-49 board is equipped with a fuse (F1).
As this component is critical to safe operation, use the specified component for replacement.

DC-77R: 2A 125A
DC-77RR-CE: 1A 250V

3-4. LED-92 BOARD

Two LED-92 boards are used. Each is equipped with a green LED, which is lit when the power is turned on.
The two LEDs are connected in series via CN-353 baord.

3-5. SWITCHING REGULATOR

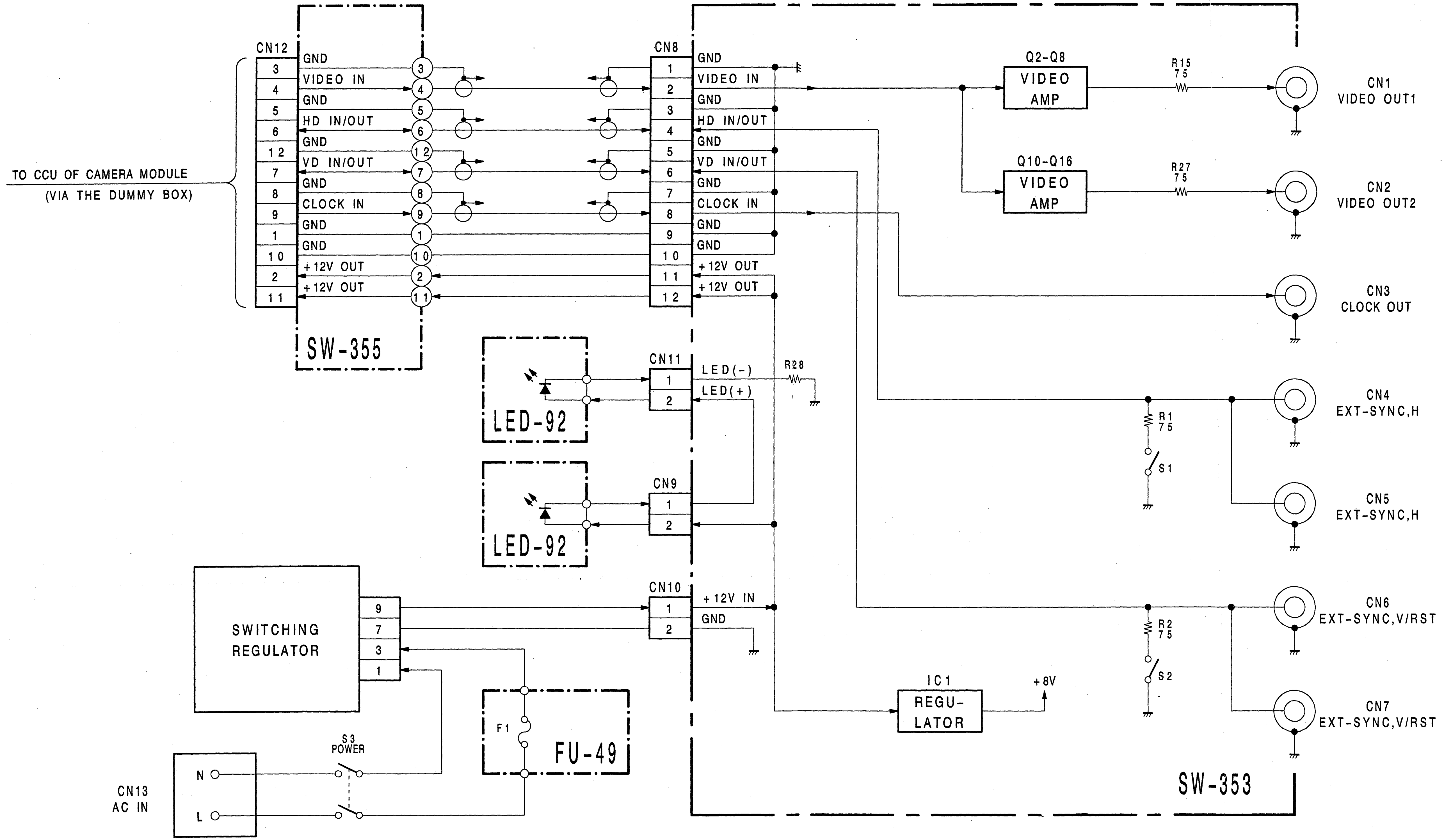
Switching Regulator inputs AC power from the outside to pins 1 and 3 of CN101 and outputs +12V DC from pin7 of CN101.

Input voltage: AC85V to 264V
Input current: 0.3A or less (when input voltage is 100V)
Input frequency: 47 Hz to 440 Hz

Output voltage: 12.0V±0.1V
Output current: 1.3A (max.)

SECTION 4
DIAGRAMS

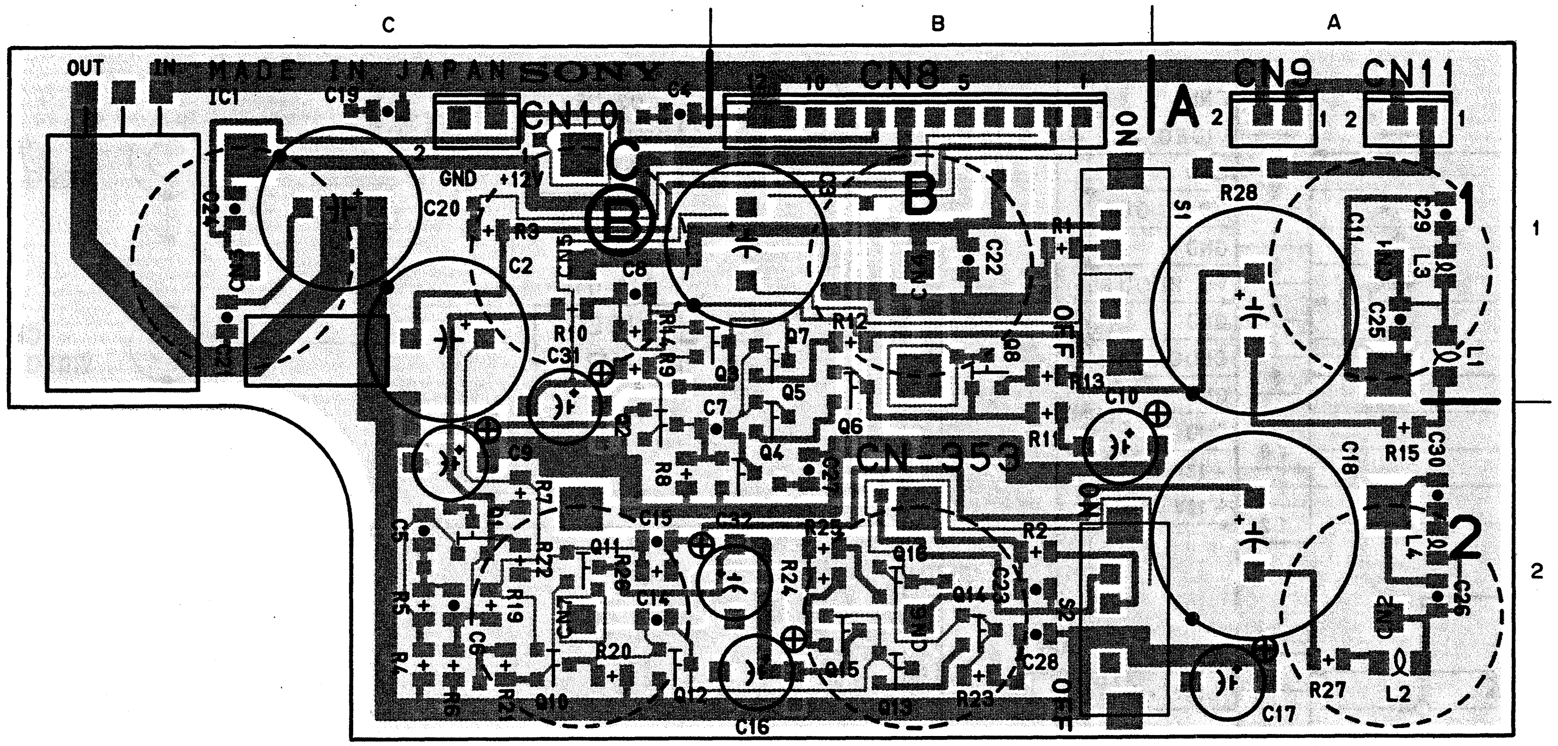
4-1. BLOCK DIAGRAM


TO CCU OF CAMERA MODULE
(VIA THE DUMMY BOX)
CN12
3 4 5 6 12 7 8 9 1 10 2 11
GND
VIDEO IN
GND
HD IN/OUT
GND
VD IN/OUT
GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
SW-355
CN8
1 2 3 4 5 6 7 8 9 10 11 12
GND
VIDEO IN
GND
HD IN/OUT
GND
VD IN/OUT
GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
Q2-Q8
VIDEO AMP
Q10-Q16
VIDEO AMP
R15 75
R27 75
CN1 VIDEO OUT1
CN2 VIDEO OUT2
CN3 CLOCK OUT
CN11
LED(-)
LED(+)
R28
LED-92
CN9
LED-92
CN4 EXT-SYNC,H
R1 75
S1
CN5 EXT-SYNC,H
SWITCHING REGULATOR
9 7 3 1
CN10
+12V IN
GND
CN6 EXT-SYNC,V/RST
R2 75
S2
CN7 EXT-SYNC,V/RST
IC1
REGU-LATOR
+8V
F1
FU-49
S3 POWER
CN13 AC IN
N
L
SW-353

OVERALL BLOCK

DC-77RR(J)
DC-77RR(UC)
DC-77RR-CE(EK)

4-2. MOUNTING DIAGRAM (911 Lot. to 003 Lot.)

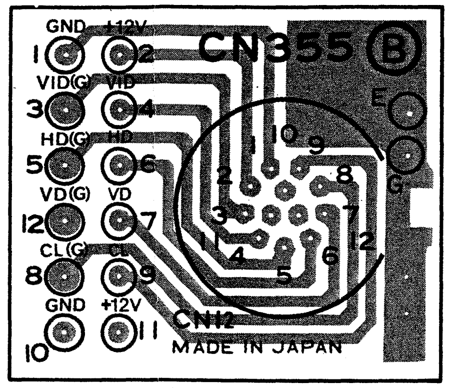

C
B
A
1
2
OUT
IN
MADE IN JAPAN SONY
IC1
C19
CN10
CN8
CN9
CN11
C
B
B
A
GND
+12V
C20
C24
C21
C2
C3
C8
R10
C31
C7
Q3
Q5
Q4
Q6
Q7
R12
Q8
C22
R1
R13
R11
C10
S1
ON
OFF
R28
C11
C29
L3
C25
L1
R15
C30
C18
L4
C26
C17
R27
L2
CN-353
C9
C5
R5
R6
R7
R22
R19
C6
R4
Q11
R26
C14
C15
R24
R25
Q16
R2
Q14
C23
C28
S2
R20
Q10
Q12
C16
Q15
Q13
R23
R21

CN-353-B SIDE-
1-633-855-11
DC-77RR(J,UC)
DC-77RR-CE(EK)

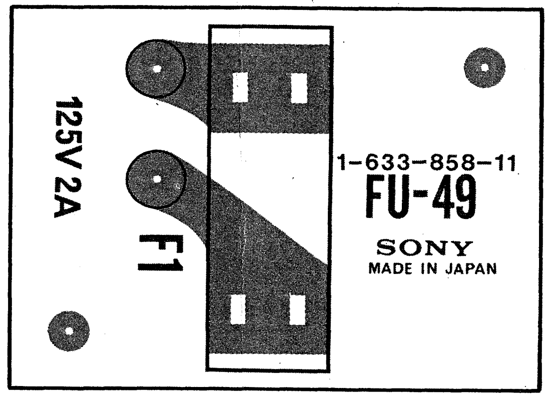
CN-353 Board Location (1-633-855-11)

C2	C-1	C28	B-2	Q1	C-1	R9	C-1
C3	B-1	C29	A-1	Q2	C-1	R10	C-1
C4	C-1	C30	A-2	Q3	B-1	R11	B-2
C5	C-2	C31	C-1	Q4	B-2	R12	B-1
C6	C-2	C32	B-2	Q5	B-2	R13	B-1
C7	B-2			Q6	B-2	R14	C-1
C8	C-1	*CN1	A-1	Q7	B-1	R15	A-2
C9	C-2	*CN2	A-2	Q8	B-1	R19	C-2
C10	B-2	*CN3	C-1	Q10	C-1	R20	C-2
C11	A-1	*CN4	B-1	Q11	C-1	R21	C-2
C14	C-2	*CN5	C-1	Q12	C-1	R22	C-2
C15	C-2	*CN6	B-2	Q13	B-2	R23	B-2
C16	B-2	*CN7	C-2	Q14	B-2	R24	B-2
C17	A-2	CN8	B-1	Q15	B-2	R25	B-2
C18	A-2	CN9	A-1	Q16	B-2	R26	C-2
C19	C-1	CN10	C-1			R27	A-2
C20	C-1	CN11	A-1	R1	B-1	R28	A-1
C21	C-1			R2	B-2		
C22	B-1	IC1	C-1	R3	C-1	*S1	A-1
C23	B-2			R4	C-2	*S2	B-2
C24	C-1	L1	A-1	R5	C-2		
C25	A-1	L2	A-2	R6	C-2		
C26	A-2	L3	A-1	R7	C-2		
C27	B-2	L4	A-2	R8	C-2		

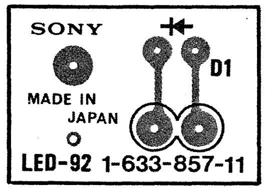
*: A SIDE


GND
+12V
1
2
CN355 Ⓑ
VID(G)
VID
3
4
HD(G)
HD
5
6
VD(G)
VD
12
7
CL(G)
CL
8
9
GND
+12V
10
11
E
G
CN12
MADE IN JAPAN

CN-355-B SIDE-
1-633-856-11,12
DC-77RR(J,UC)
DC-77RR-CE(EK)

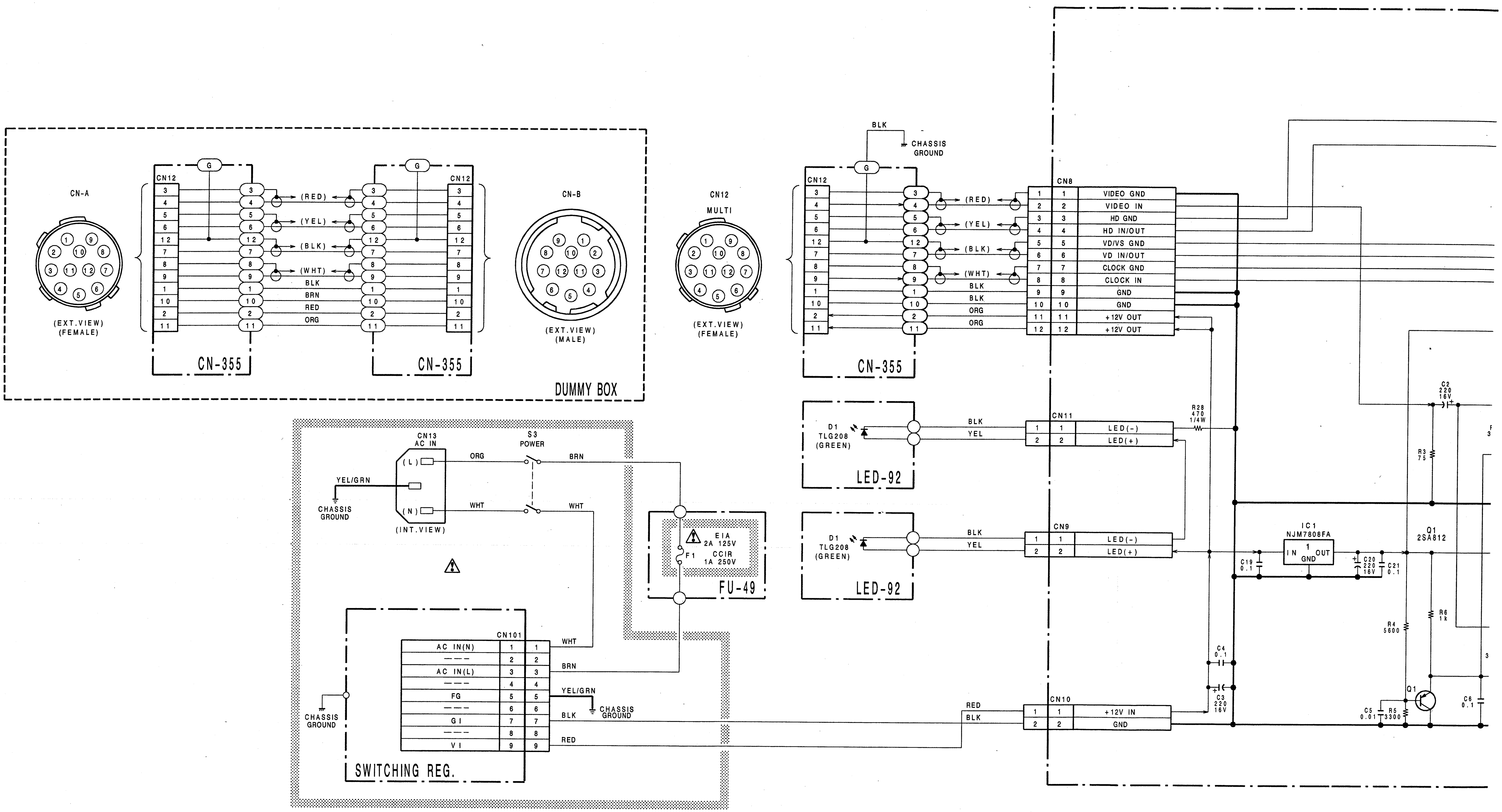

125V 2A
F1
1-633-858-11
FU-49
SONY
MADE IN JAPAN

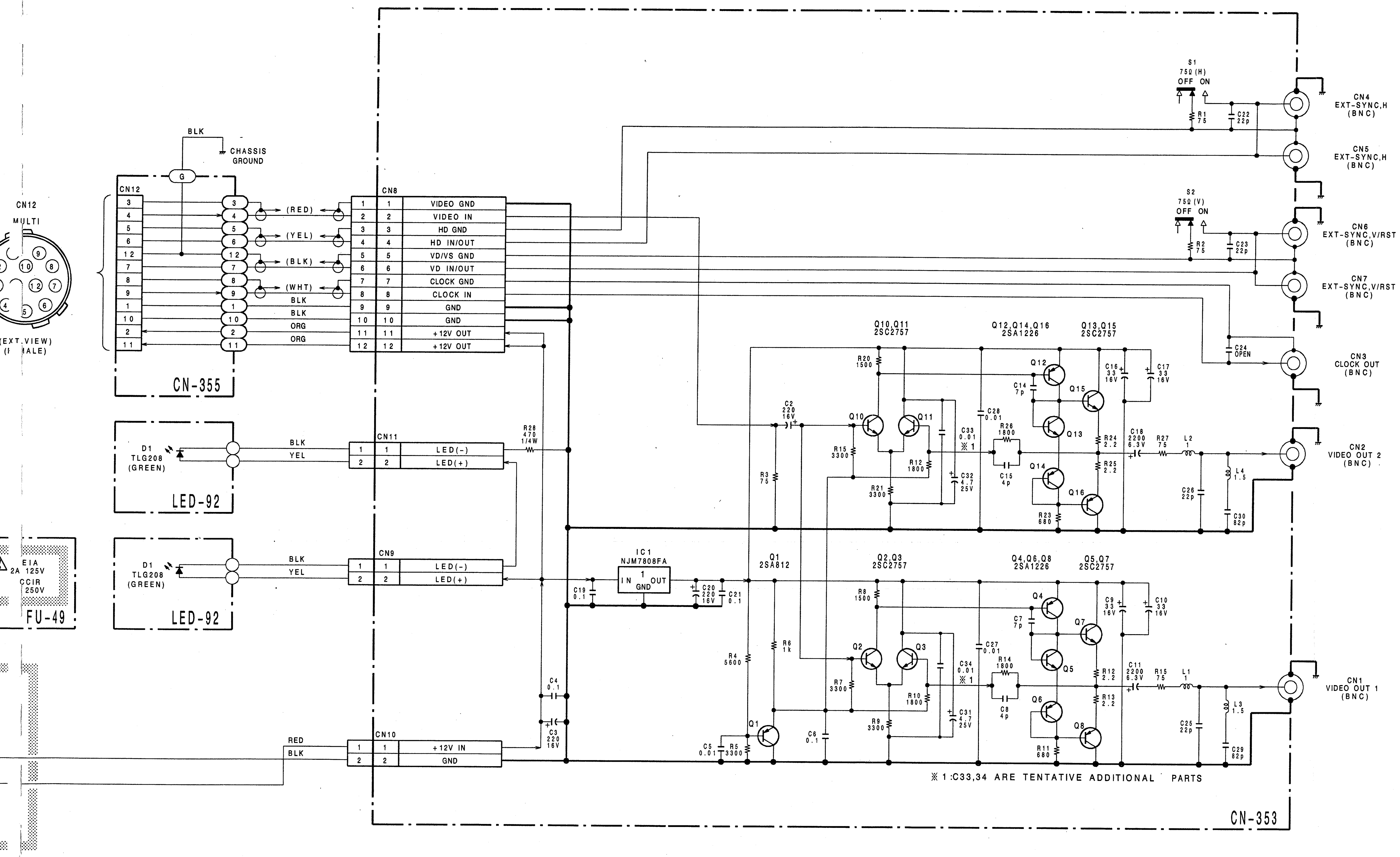
FU-49-COMPOMENT SIDE-
1-633-858-11
DC-77RR(J,UC)
DC-77RR-CE(EK)


SONY
D1
MADE IN JAPAN
LED-92 1-633-857-11

LED-92-COMPOMENT SIDE-
1-633-857-11
DC-77RR(J,UC)
DC-77RR-CE(EK)

4-3. SCHEMATIC DIAGRAM (911 Lot. to 003 Lot.)


CN-A
(EXT.VIEW)
(FEMALE)
CN12
CN-355
CN-355
G
(RED)
(YEL)
(BLK)
(WHT)
BLK
BRN
RED
ORG
CN-B
(EXT.VIEW)
(MALE)
DUMMY BOX
CN12
MULTI
(EXT.VIEW)
(FEMALE)
BLK
CHASSIS GROUND
CN8
VIDEO GND
VIDEO IN
HD GND
HD IN/OUT
VD/VS GND
VD IN/OUT
CLOCK GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
D1
TLG208
(GREEN)
LED-92
CN11
LED(-)
LED(+)
BLK
YEL
R28
470
1/4W
CN9
CN10
+12V IN
GND
RED
BLK
CN13
AC IN
(L)
(N)
(INT.VIEW)
YEL/GRN
CHASSIS GROUND
S3
POWER
ORG
BRN
WHT
EIA
2A 125V
CCIR
1A 250V
F1
FU-49
CN101
AC IN(N)
AC IN(L)
FG
GI
VI
YEL/GRN
CHASSIS GROUND
SWITCHING REG.
IC1
NJM7808FA
IN
OUT
GND
C19
0.1
C20
220
16V
C21
0.1
C2
220
16V
R3
75
Q1
2SA812
R4
5600
R6
1k
C4
0.1
C3
220
16V
C5
0.01
R5
3300
C6
0.1


CN12
MULTI
(EXT.VIEW)
BLK
CHASSIS GROUND
G
CN12
CN8
(RED)
(YEL)
(BLK)
(WHT)
BLK
BLK
ORG
ORG
VIDEO GND
VIDEO IN
HD GND
HD IN/OUT
VD/VS GND
VD IN/OUT
CLOCK GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
CN-355
D1
TLG208
(GREEN)
LED-92
CN11
LED(-)
LED(+)
R28
470
1/4W
CN9
EIA
2A 125V
CCIR
250V
FU-49
CN10
RED
BLK
+12V IN
GND
IC1
NJM7808FA
IN
OUT
GND
C19
0.1
C20
220
16V
C21
0.1
C4
0.1
C3
220
16V
S1
75Ω (H)
OFF ON
R1
75
C22
22p
CN4
EXT-SYNC,H
(BNC)
CN5
EXT-SYNC,H
(BNC)
S2
75Ω (V)
OFF ON
R2
75
C23
22p
CN6
EXT-SYNC,V/RST
(BNC)
CN7
EXT-SYNC,V/RST
(BNC)
C24
OPEN
CN3
CLOCK OUT
(BNC)
Q10,Q11
2SC2757
Q12,Q14,Q16
2SA1226
Q13,Q15
2SC2757
R20
1500
C2
220
16V
C14
7p
C16
33
16V
C17
33
16V
C28
0.01
R26
1800
C33
0.01
※1
R15
3300
R12
1800
R3
75
C32
4.7
25V
C15
4p
R21
3300
R23
680
R24
2.2
R25
2.2
C18
2200
6.3V
R27
75
L2
1
L4
1.5
C26
22p
C30
82p
CN2
VIDEO OUT 2
(BNC)
Q1
2SA812
Q2,Q3
2SC2757
Q4,Q6,Q8
2SA1226
Q5,Q7
2SC2757
R8
1500
C7
7p
C9
33
16V
C10
33
16V
R6
1k
R4
5600
C27
0.01
R14
1800
C34
0.01
※1
R7
3300
R10
1800
C31
4.7
25V
C8
4p
R9
3300
R11
680
R12
2.2
R13
2.2
C11
2200
6.3V
R15
75
L1
1
L3
1.5
C25
22p
C29
82p
C5
0.01
R5
3300
C6
0.1
CN1
VIDEO OUT 1
(BNC)
※1:C33,34 ARE TENTATIVE ADDITIONAL PARTS
CN-353

FRAME

(911 LOT. TO 003 LOT.)

CN-353 BOARD
1-633-855-11

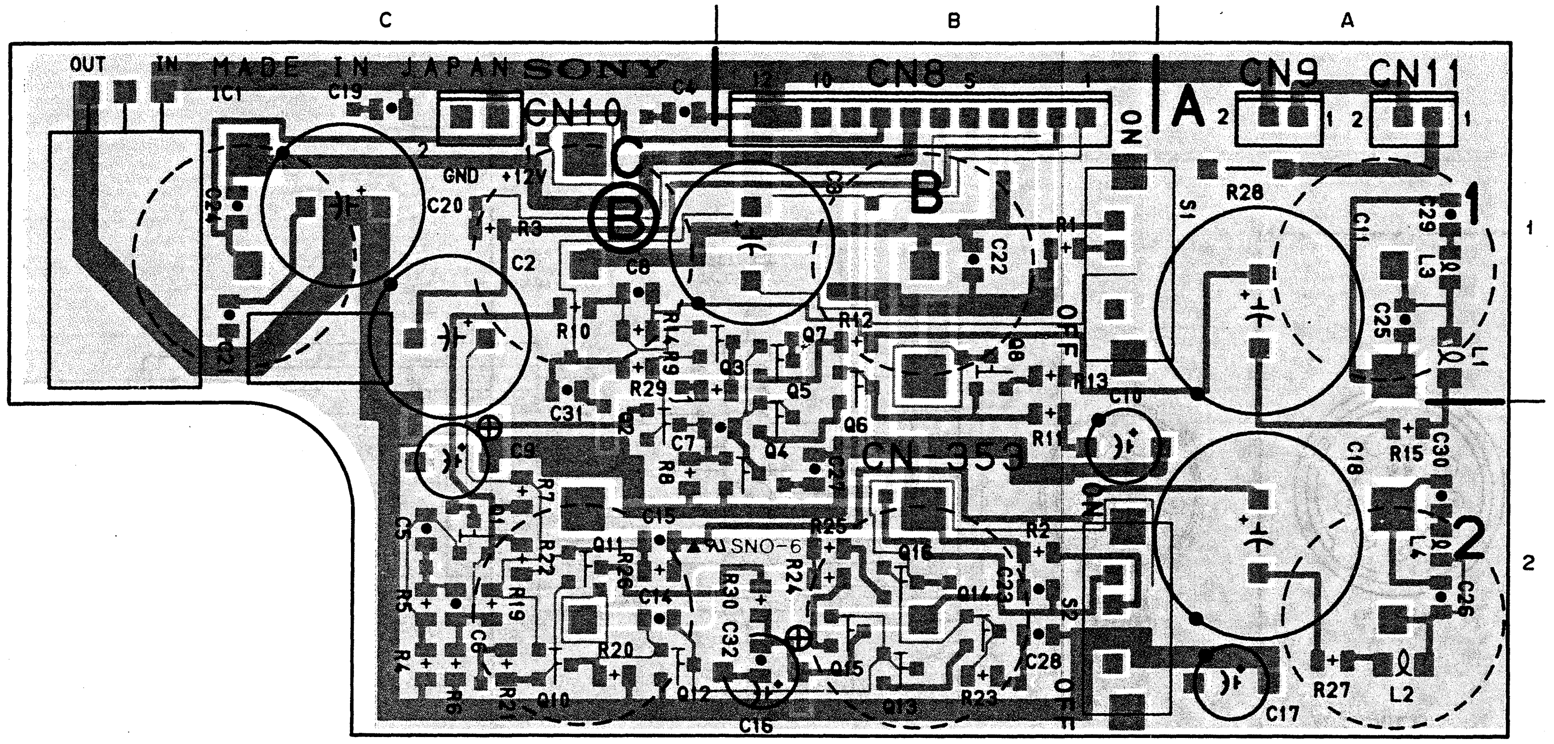
CN-355 BOARD
1-633-856-11,12

FU-49 BOARD
1-633-858-11

LED-92 BOARD
1-633-857-11

DC-77RR(J):EIA MODEL
DC-77RR(UC):EIA MODEL
DC-77RR-CE(EK):CCIR MODEL

4-4. MOUNTING DIAGRAM (004 Lot. and Higher Lot.)

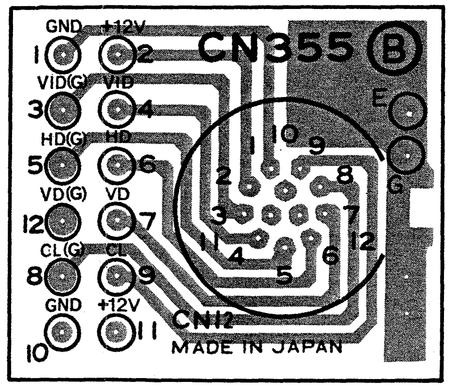

C
B
A
1
2
OUT
IN
MADE IN JAPAN
SONY
IC1
CN10
CN8
CN9
CN11
CN-353
GND
+12V
ON
OFF
S1
S2
SNO-6

CN-353-B SIDE-
1-633-855-12
DC-77RR(J,UC)
DC-77RR-CE(EK)

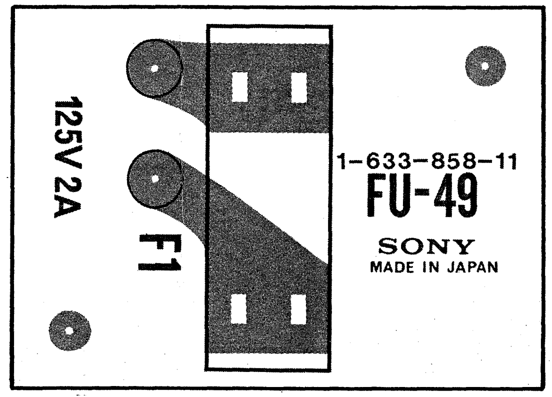
CN-353 Board Location (1-633-855-12)

C2	C-1
C3	B-1
C4	C-1
C5	C-2
C6	C-2
C7	B-2
C8	C-1
C9	C-2
C10	B-2
C11	A-1
C14	C-2
C15	C-2
C16	B-2
C17	A-2
C18	A-2
C19	C-1
C20	C-1
C21	C-1
C22	B-1
C23	B-2
C24	C-1
C25	A-1
C26	A-2
C27	B-2
C28	B-2
C29	A-1
C30	A-2
C31	C-1
C32	B-2
*CN1	A-1
*CN2	A-2
*CN3	C-1
*CN4	B-1
*CN5	C-1
*CN6	B-2
*CN7	C-2
CN8	B-1
CN9	A-1
CN10	C-1
CN11	A-1
IC1	C-1
L1	A-1
L2	A-2
L3	A-1
L4	A-2
Q1	C-1
Q2	C-1
Q3	B-1
Q4	B-2
Q5	B-2
Q6	B-2
Q7	B-1
Q8	B-1
Q10	C-1
Q11	C-1
Q12	C-1
Q13	B-2
Q14	B-2
Q15	B-2
Q16	B-2
R1	B-1
R2	B-2
R3	C-1
R4	C-2
R5	C-2
R6	C-2
R7	C-2
R8	C-2
R9	C-1
R10	C-1
R11	B-2
R12	B-1
R13	B-1
R14	C-1
R15	A-2
R19	C-2
R20	C-2
R21	C-2
R22	C-2
R23	B-2
R24	B-2
R25	B-2
R26	C-2
R27	A-2
R28	A-1
R29	C-1
R30	B-2
*S1	A-1
*S2	A-2

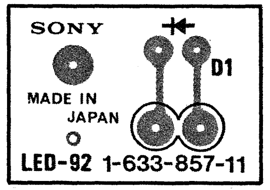
*: A SIDE


GND
+12V
VID(G)
VID
HD(G)
HD
VD(G)
VD
CL(G)
CL
CN355
B
E
G
CN12
MADE IN JAPAN

CN-355-B SIDE-
1-633-856-11,12
DC-77RR(J,UC)
DC-77RR-CE(EK)

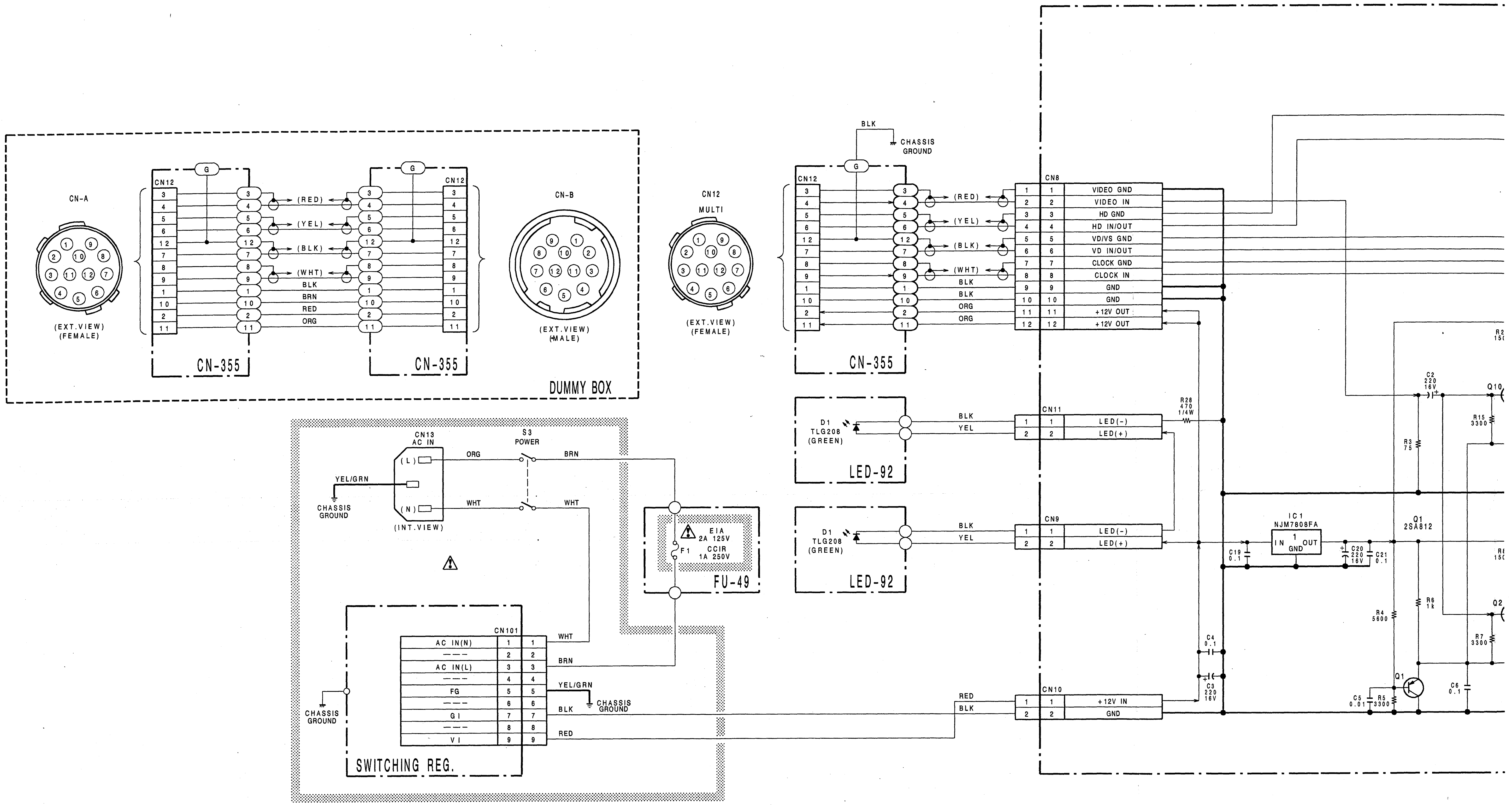

125V 2A
F1
1-633-858-11
FU-49
SONY
MADE IN JAPAN

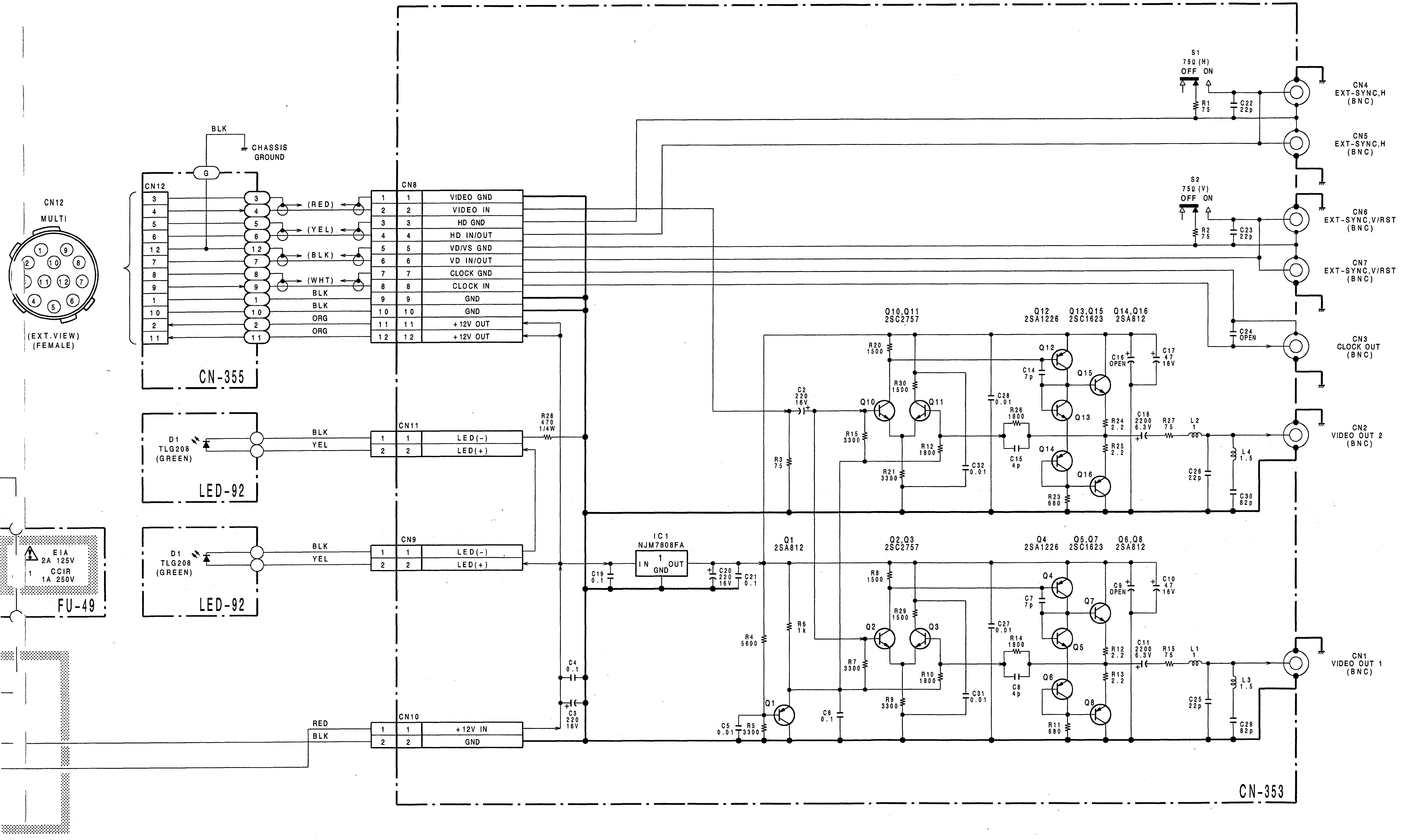
FU-49-COMPOMENT SIDE-
1-633-858-11
DC-77RR(J,UC)
DC-77RR-CE(EK)


SONY
D1
MADE IN JAPAN
LED-92 1-633-857-11

LED-92-COMPOMENT SIDE-
1-633-857-11
DC-77RR(J,UC)
DC-77RR-CE(EK)

4-5. SCHEMATIC DIAGRAM (004 Lot. and Higher Lot.)


CN-A
(EXT.VIEW)
(FEMALE)
CN12
G
(RED)
(YEL)
(BLK)
(WHT)
BLK
BRN
RED
ORG
CN-355
CN-355
CN-B
(EXT.VIEW)
(MALE)
DUMMY BOX
CN12
MULTI
(EXT.VIEW)
(FEMALE)
BLK
CHASSIS GROUND
CN-355
CN8
VIDEO GND
VIDEO IN
HD GND
HD IN/OUT
VD/VS GND
VD IN/OUT
CLOCK GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
CN13
AC IN
(L)
(N)
(INT.VIEW)
YEL/GRN
CHASSIS GROUND
S3
POWER
ORG
BRN
WHT
WHT
EIA 2A 125V
CCIR 1A 250V
F1
FU-49
D1
TLG208
(GREEN)
LED-92
CN11
LED(-)
LED(+)
R28 470 1/4W
CN9
LED(-)
LED(+)
D1
TLG208
(GREEN)
LED-92
CN101
AC IN(N)
AC IN(L)
FG
GI
VI
WHT
BRN
YEL/GRN
CHASSIS GROUND
BLK
RED
CHASSIS GROUND
SWITCHING REG.
CN10
+12V IN
GND
RED
BLK
IC1
NJM7808FA
IN
GND
OUT
C19 0.1
C20 220 16V
C21 0.1
C4 0.1
C3 220 16V
C2 220 16V
R3 75
R4 5600
R6 1k
R15 3300
R7 3300
R5 3300
C5 0.01
C6 0.1
Q1 2SA812
Q1
Q10
Q2
R2 15
R8 15


CN12
MULTI
(EXT.VIEW)
(FEMALE)
BLK
CHASSIS GROUND
G
CN12
CN-355
(RED)
(YEL)
(BLK)
(WHT)
BLK
BLK
ORG
ORG
CN8
VIDEO GND
VIDEO IN
HD GND
HD IN/OUT
VD/VS GND
VD IN/OUT
CLOCK GND
CLOCK IN
GND
GND
+12V OUT
+12V OUT
D1
TLG208
(GREEN)
LED-92
BLK
YEL
CN11
LED(-)
LED(+)
R28
470
1/4W
CN9
EIA
2A 125V
CCIR
1A 250V
FU-49
RED
BLK
CN10
+12V IN
GND
C4
0.1
C3
220
16V
C19
0.1
IC1
NJM7808FA
IN
OUT
GND
C20
220
16V
C21
0.1
S1
75Ω (H)
OFF ON
R1
75
C22
22p
CN4
EXT-SYNC,H
(BNC)
CN5
EXT-SYNC,H
(BNC)
S2
75Ω (V)
OFF ON
R2
75
C23
22p
CN6
EXT-SYNC,V/RST
(BNC)
CN7
EXT-SYNC,V/RST
(BNC)
C24
OPEN
CN3
CLOCK OUT
(BNC)
Q10,Q11
2SC2757
Q12
2SA1226
Q13,Q15
2SC1623
Q14,Q16
2SA812
R20
1500
R30
1500
C2
220
16V
R15
3300
R3
75
R12
1800
R21
3300
C32
0.01
C28
0.01
R26
1800
C15
4p
C14
7p
C16
OPEN
C17
47
16V
R24
2.2
R25
2.2
R23
680
C18
2200
6.3V
R27
75
L2
1
L4
1.5
C26
22p
C30
82p
CN2
VIDEO OUT 2
(BNC)
Q1
2SA812
Q2,Q3
2SC2757
Q4
2SA1226
Q5,Q7
2SC1623
Q6,Q8
2SA812
R8
1500
R29
1500
R6
1k
R4
5600
R7
3300
R10
1800
R9
3300
C31
0.01
C27
0.01
R14
1800
C8
4p
C7
7p
C9
OPEN
C10
47
16V
R12
2.2
R13
2.2
R11
680
C11
2200
6.3V
R15
75
L1
1
L3
1.5
C25
22p
C29
82p
C5
0.01
R5
3300
C6
0.1
CN1
VIDEO OUT 1
(BNC)
CN-353

FRAME
(004 LOT. AND HIGHER LOT.)

CN-353 BOARD
1-633-855-12

CN-355 BOARD
1-633-856-12

FU-49 BOARD
1-633-858-11

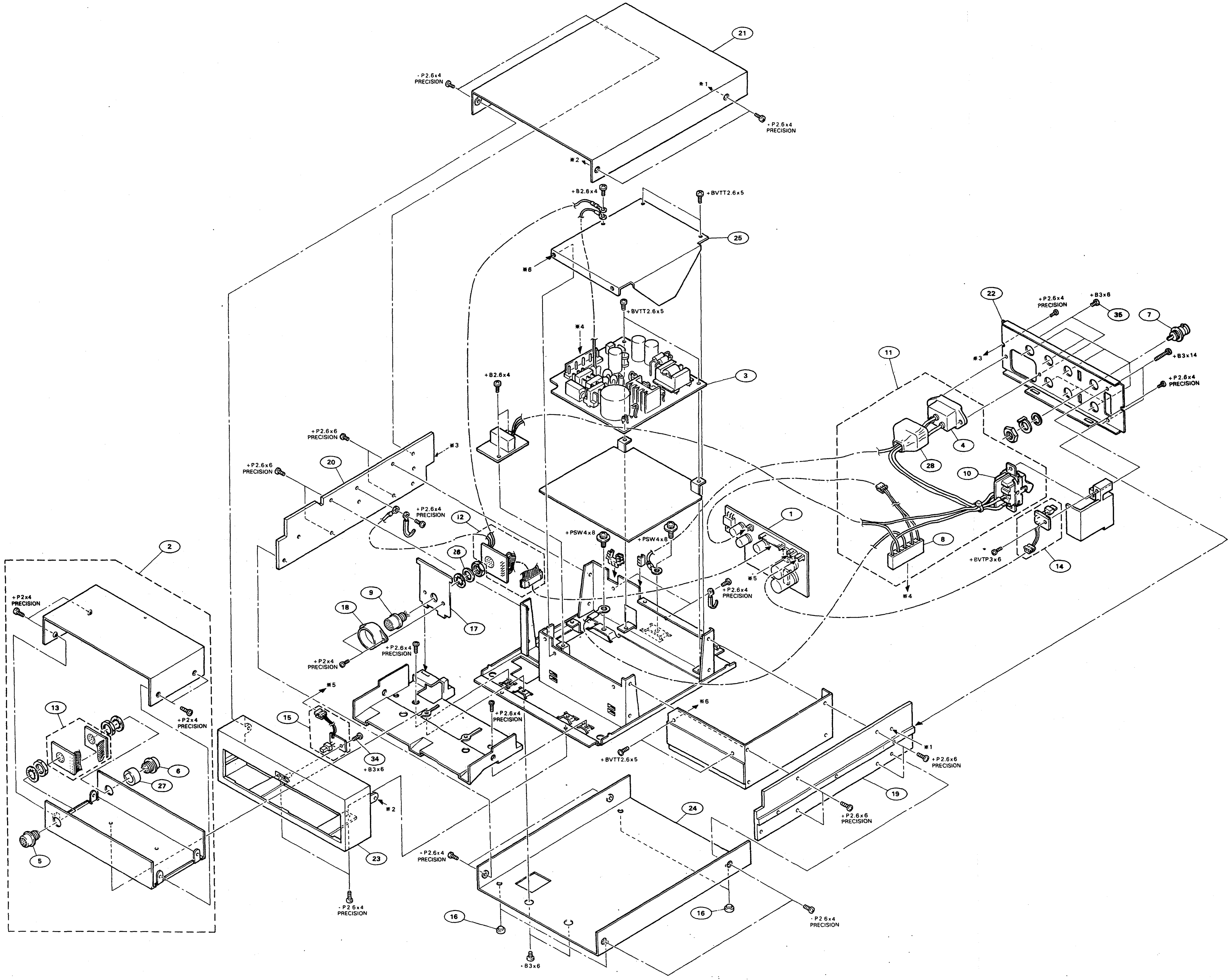
LED-92 BOARD
1-633-857-11

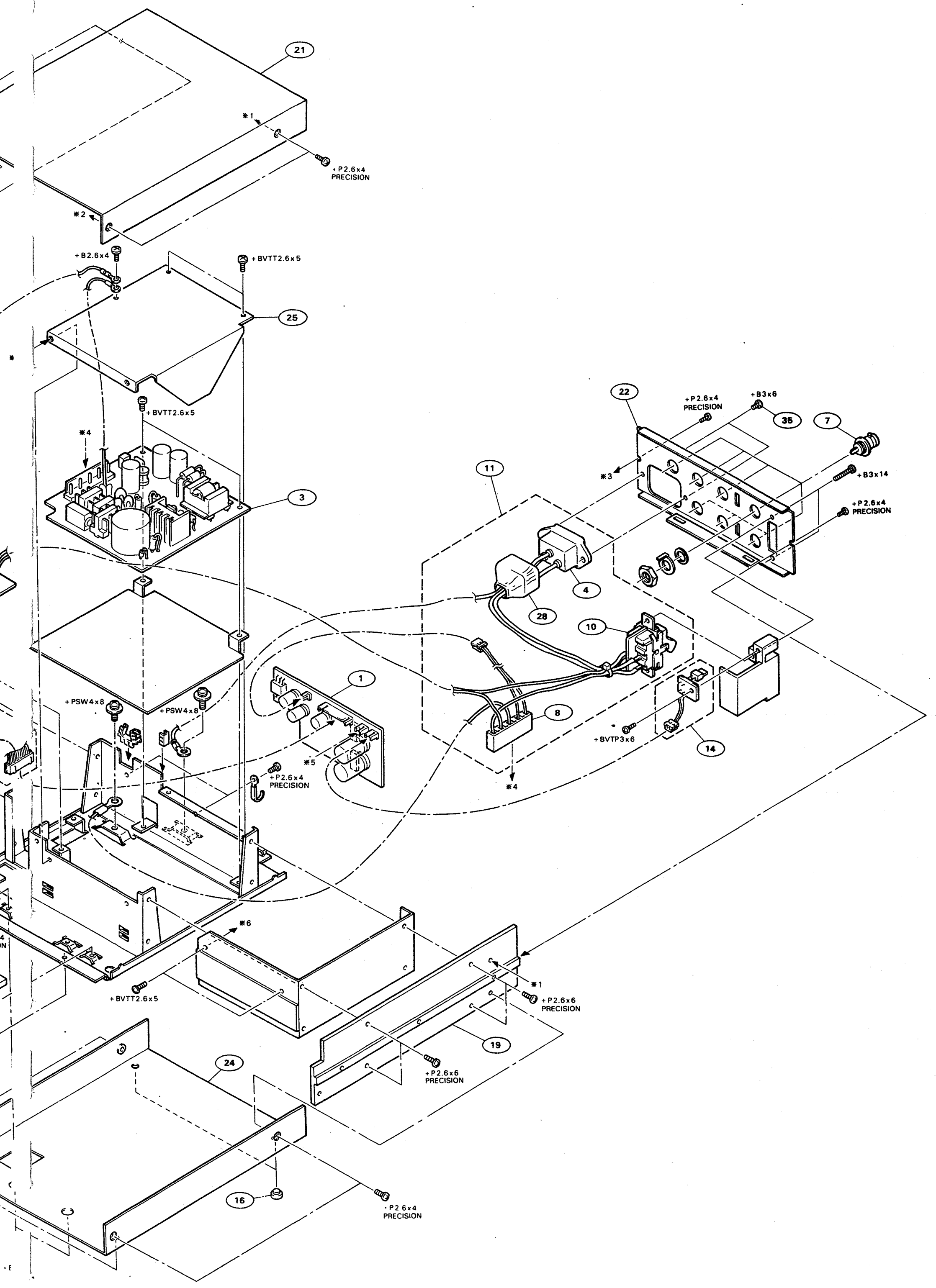
DC-77RR(J):EIA MODEL
DC-77RR(UC):EIA MODEL
DC-77RR-CE(EK):CCIR MODEL

SECTION 5
PARTS LIST

5-1. EXPLODED VIEW

No.	Parts No.	Description
1	*A-7515-124-A	COMPLETE PCB, CN-353
2	*A-7580-027-A	BOX ASSY, DUMMY
⚠ 3	1-413-517-11	SWITCHING REGULATOR
4	1-560-222-11	INLET, AC 3P
5	1-562-221-31	CONNECTOR, ROUND TYPE, 12P, FEMALE
6	1-562-381-21	CONNECTOR, ROUND TYPE, 12P, MALE
7	1-562-382-31	CONNECTOR, BNC, FEMALE
⚠ 8	*1-562-800-11	HOUSING, CONNECTOR 9P
9	1-569-423-11	CONNECTOR, ROUND TYPE, 12P, FEMALE
⚠10	1-570-117-11	SWITCH, SEESAW (AC POWER)
11	*1-945-458-12	HARNESS (REG)
12	*1-945-459-12	HARNESS (CN-355)
13	*1-945-460-12	HARNESS (DMY)
14	*1-945-461-11	HARNESS (LED), SHORT
15	*1-945-461-21	HARNESS (LED), LONG
16	2-362-365-00	FOOT, RUBBER
17	*2-385-023-01	SUPPORT
18	*2-385-024-01	GUIDE (1), CONNECTOR
19	*2-385-026-01	CHASSIS, RIGHT, ADP SIDE
20	*2-385-027-01	CHASSIS, LEFT, ADP SIDE
21	*2-385-028-01	CASE, UPPER, ADP
22	*2-385-030-01	PANEL, REAR, ADP
23	*2-385-031-01	PANEL, FRONT, ADP
24	*2-385-032-01	CASE, LOWER, ADP
25	*2-385-033-02	PLATE, SHIELD, POWER
26	*3-718-804-01	LUG, GROUND
27	*3-718-852-01	GUIDE (2), CONNECTOR
28	4-601-466-11	COVER, 3P INLET
	7-627-553-48	SCREW, PRECISION +P 2.0x4.0
	7-627-556-38	SCREW, PRECISION +P 2.6x4.0
	7-627-556-78	SCREW, PRECISION +P 2.6x6.0
	7-621-773-86	SCREW +B 2.6x4
	7-682-545-04	SCREW +B 3x4
34	7-682-547-04	SCREW +B 3x6
35	7-682-547-09	SCREW +B 3x6
	7-682-551-09	SCREW +B 3x14
	7-682-961-01	SCREW +PSW 4x8
	7-685-645-79	SCREW +BVTP 3x6
	7-685-861-01	SCREW +BVTT 2.6x5


21
+P2.6x4 PRECISION
※1
※2
+P2.6x4 PRECISION
+B2.6x4
+BVTT2.6x5
25
※6
+BVTT2.6x5
※4
3
+B2.6x4
22
+P2.6x4 PRECISION
+B3x6
35
7
※3
+B3x14
+P2.6x4 PRECISION
11
4
28
10
8
※4
+BVTP3x6
14
1
※5
+P2.6x4 PRECISION
+P2.6x6 PRECISION
+P2.6x6 PRECISION
20
※3
+P2.6x4 PRECISION
12
26
+PSW4x8
+PSW4x8
9
18
17
+P2x4 PRECISION
+P2.6x4 PRECISION
※5
15
34
+B3x6
+P2.6x4 PRECISION
+BVTT2.6x5
※6
※1
+P2.6x6 PRECISION
19
+P2.6x6 PRECISION
2
+P2x4 PRECISION
+P2x4 PRECISION
13
6
27
5
23
※2
+P2.6x4 PRECISION
+P2.6x4 PRECISION
24
16
16
+B3x6
+P2.6x4 PRECISION


21
※1
+P2.6x4
PRECISION
※2
+B2.6x4
+BVTT2.6x5
25
+BVTT2.6x5
※4
3
22
+P2.6x4
PRECISION
+B3x6
35
7
※3
+B3x14
+P2.6x4
PRECISION
11
4
28
10
1
8
+PSW4x8
+PSW4x8
※5
+P2.6x4
PRECISION
+BVTP3x6
14
※4
※6
+BVTT2.6x5
※1
+P2.6x6
PRECISION
19
+P2.6x6
PRECISION
24
16
·P2 6x4
PRECISION

5-2. ACCESSORIES

Q'ty	Parts No.	Description
1pc	1-534-754-00	CORD, POWER : J model
1pc	1-556-760-11	CORD, POWER (3 CORE): EK model
1pc	1-557-377-11	CORD, POWER : UC model
1pc	3-751-383-11	MANUAL, INSTRUCTION : J/EK models
1pc	3-751-383-11	MANUAL, INSTRUCTION : UC model

5-3. ELECTRICAL PARTS LIST

CN-353 Board

Ref No.	Parts No.	Description	<Note>
	*A-7515-124-A	COMPLETE PCB, CN-353	
C2	1-124-120-11	ELECT 220 20% 25V	
C3	1-124-120-11	ELECT 220 20% 25V	
C4	1-163-038-00	CERAMIC CHIP 0.1 25V	
C5	1-164-232-11	CERAMIC CHIP 0.01 10% 100V	
C6	1-163-038-00	CERAMIC CHIP 0.1 25V	
C7	1-163-090-00	CERAMIC CHIP 7pF 50V	
C8	1-163-087-00	CERAMIC CHIP 4pF 50V	
C9	1-131-374-00	TANTALUM 33 10% 16V	<1>
C10	1-131-374-00	TANTALUM 33 10% 16V	<1>
	1-124-477-11	TANTALUM 47 20% 25V	<2>
C11	1-124-893-11	ELECT 2200 20% 20V	
C14	1-163-090-00	CERAMIC CHIP 7pF 50V	
C15	1-163-087-00	CERAMIC CHIP 4pF 50V	
C16	1-131-374-00	TANTALUM 33 10% 16V	<1>
C17	1-131-374-00	TANTALUM 33 10% 16V	<1>
	1-124-477-11	TANTALUM 47 20% 25V	<2>
C18	1-124-893-11	ELECT 2200 20% 20V	
C19	1-163-038-00	CERAMIC CHIP 0.1 25V	
C20	1-124-120-11	ELECT 220 20% 25V	
C21	1-163-038-00	CERAMIC CHIP 0.1 25V	
C22	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	
C23	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	
C25	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	
C26	1-163-101-00	CERAMIC CHIP 22pF 5% 50V	
C27	1-164-232-11	CERAMIC CHIP 0.01 10% 100V	
C28	1-164-232-11	CERAMIC CHIP 0.01 10% 100V	
C29	1-163-115-00	CERAMIC CHIP 82pF 5% 50V	
C30	1-163-115-00	CERAMIC CHIP 82pF 5% 50V	
C31	1-131-351-00	TANTALUM 4.7 10% 35V	<1>
	1-164-232-11	CERAMIC CHIP 0.01 10% 100V	<2>
C32	1-131-351-00	TANTALUM 4.7 10% 35V	<1>
	1-164-232-11	CERAMIC CHIP 0.01 10% 100V	<2>
C33	1-161-051-00	CERAMIC 0.01 10% 50V	<1>
C34	1-161-051-00	CERAMIC 0.01 10% 50V	<1>
CN8	*1-506-477-11	CONNECTOR, 12P, MALE	
CN9	*1-506-467-11	CONNECTOR, 2P, MALE	
CN10	*1-560-890-00	CONNECTOR, 2P, MALE	
CN11	*1-506-467-11	CONNECTOR, 2P, MALE	
IC1	8-759-982-07	IC RC7808FA	
L1	1-410-192-51	INDUCTOR CHIP 1	
L2	1-410-192-51	INDUCTOR CHIP 1	
L3	1-410-995-41	INDUCTOR CHIP 1.5	
L4	1-410-995-41	INDUCTOR CHIP 1.5	

Notes <1>: 911 lot. to 003 lot.
<2>: 004 lot. and higher lot.

(CN-353 Board)

Ref No.	Parts No.	Description	<Note>
Q1	8-729-216-22	TRANSISTOR 2SA1162	
Q2	8-729-175-73	TRANSISTOR 2SC2757	
Q3	8-729-175-73	TRANSISTOR 2SC2757	
Q4	8-729-122-63	TRANSISTOR 2SA1226	
Q5	8-729-175-73	TRANSISTOR 2SC2757	<1>
	8-729-100-66	TRANSISTOR 2SC1623	<2>
Q6	8-729-122-63	TRANSISTOR 2SA1226	<1>
	8-729-216-22	TRANSISTOR 2SA1162	<2>
Q7	8-729-175-73	TRANSISTOR 2SC2757	<1>
	8-729-100-66	TRANSISTOR 2SC1623	<2>
Q8	8-729-122-63	TRANSISTOR 2SA1226	<1>
	8-729-216-22	TRANSISTOR 2SA1162	<2>
Q10	8-729-175-73	TRANSISTOR 2SC2757	
Q11	8-729-175-73	TRANSISTOR 2SC2757	
Q12	8-729-122-63	TRANSISTOR 2SA1226	
Q13	8-729-175-73	TRANSISTOR 2SC2757	<1>
	8-729-100-66	TRANSISTOR 2SC1623	<2>
Q14	8-729-122-63	TRANSISTOR 2SA1226	<1>
	8-729-216-22	TRANSISTOR 2SA1162	<2>
Q15	8-729-175-73	TRANSISTOR 2SC2757	<1>
	8-729-100-66	TRANSISTOR 2SC1623	<2>
Q16	8-729-122-63	TRANSISTOR 2SA1226	<1>
	8-729-216-22	TRANSISTOR 2SA1162	<2>
R1	1-216-022-00	METAL CHIP 75 5% 1/10W	
R2	1-216-022-00	METAL CHIP 75 5% 1/10W	
R3	1-216-022-00	METAL CHIP 75 5% 1/10W	
R4	1-216-067-00	METAL CHIP 5.6K 5% 1/10W	
R5	1-216-061-00	METAL CHIP 3.3K 5% 1/10W	
R6	1-216-049-00	METAL CHIP 1K 5% 1/10W	
R7	1-216-061-00	METAL CHIP 3.3K 5% 1/10W	
R8	1-216-053-00	METAL CHIP 1.5K 5% 1/10W	
R9	1-216-061-00	METAL CHIP 3.3K 5% 1/10W	
R10	1-216-055-00	METAL CHIP 1.8K 5% 1/10W	
R11	1-216-045-00	METAL CHIP 680 5% 1/10W	
R12	1-216-298-00	METAL CHIP 2.2 5% 1/10W	
R13	1-216-298-00	METAL CHIP 2.2 5% 1/10W	
R14	1-216-055-00	METAL CHIP 1.8K 5% 1/10W	
R15	1-216-022-00	METAL CHIP 75 5% 1/10W	
R19	1-216-061-00	METAL CHIP 3.3K 5% 1/10W	
R20	1-216-053-00	METAL CHIP 1.5K 5% 1/10W	
R21	1-216-061-00	METAL CHIP 3.3K 5% 1/10W	
R22	1-216-055-00	METAL CHIP 1.8K 5% 1/10W	
R23	1-216-045-00	METAL CHIP 680 5% 1/10W	
R24	1-216-298-00	METAL CHIP 2.2 5% 1/10W	
R25	1-216-298-00	METAL CHIP 2.2 5% 1/10W	
R26	1-216-055-00	METAL CHIP 1.8K 5% 1/10W	
R27	1-216-022-00	METAL CHIP 75 5% 1/10W	
R28	1-249-413-11	CARBON 470 5% 1/4W	
R29	1-216-053-00	METAL CHIP 1.5K 5% 1/10W	<2>
R30	1-216-053-00	METAL CHIP 1.5K 5% 1/10W	<2>
S1	1-554-377-00	SWITCH, SLIDE	
S2	1-554-377-00	SWITCH, SLIDE	

CN-355 Board

Q'ty	Parts No.	Description
1pc	*1-945-459-12	HARNESS (CN-355)
1pc	*1-535-199-11	TERMINAL, SOLDERLESS
1pc	*1-562-157-11	HOUSING, CONNECTOR 12P
12pcs	*1-564-026-00	CONTACT, RECEPTACLE
1pc	*1-633-856-12	PC BOARD, CN-355
1pc	*1-945-460-12	HARNESS (DMY)
2pcs	*1-633-856-12	PC BOARD, CN-355

FU-49 Board

Ref No. or Q'ty	Parts No.	Description
2pcs	1-533-037-99	HOLDER, FUSE
1pc	*1-633-858-11	PC BOARD, FU-49
F1	1-532-078-00	FUSE, TIME-LAG 1A 250V : EK model
	1-532-743-11	FUSE, GLASS TUBE 2A 125V : UC/J model

LED-92 Board

Ref No. or Q'ty	Parts No.	Description
1pc	*1-945-461-11	HARNESS (LED), SHORT
1pc	*1-562-147-11	HOUSING, CONNECTOR 2P
2pcs	*1-564-026-00	CONTACT, RECEPTACLE
1pc	*1-633-857-11	PC BOARD, LED-92
D1	8-719-822-08	DIODE TLG208
1pc	*1-945-461-21	HARNESS (LED), LONG
1pc	*1-562-147-11	HOUSING, CONNECTOR 2P
2pcs	*1-564-026-00	CONTACT, RECEPTACLE
1pc	*1-633-857-11	PC BOARD, LED-92
D1	8-719-822-08	DIODE TLG208

STANDARD LENS
VCL-16Y-M

LENS

Standard Lens(VCL-16Y-M)

No.	Parts No.	Description
1	3-707-313-01	CAP, FRONT (FOR VCL-16Y-M)
2	3-707-314-01	CAP, REAR